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Antonakou et al.

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(54) **SMART DISPENSER SYSTEM AND METHODS OF USE**

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B26B 21/40 (2006.01)

(52) **U.S. Cl.**
CPC ***A45D 27/225*** (2013.01); ***B26B 21/405*** (2013.01)

(58) **Field of Classification Search**
CPC .. A45D 27/225; B26B 21/405; B26B 21/4056
See application file for complete search history.

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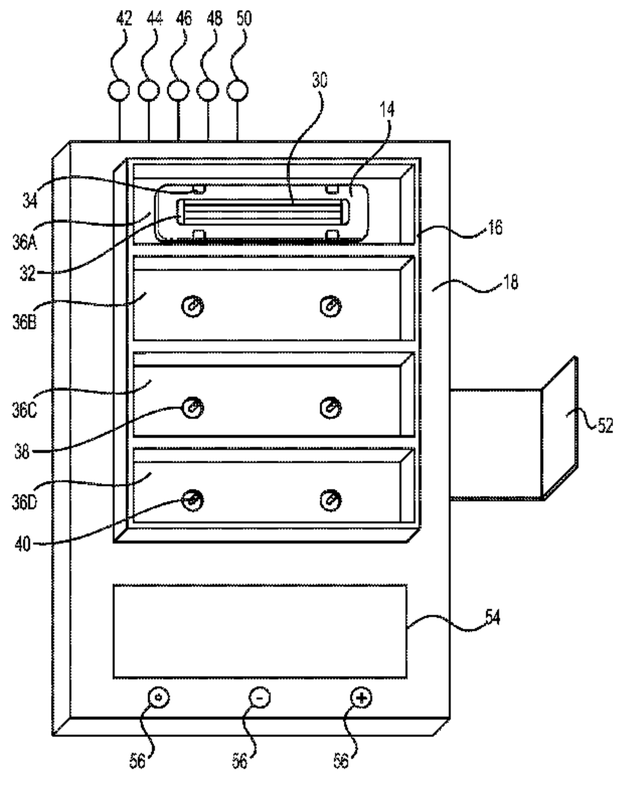
(57) **ABSTRACT**

A shaving system including a dispenser having a plurality of slots, a first of which is configured to releasably receive a cartridge having at least one razor blade. An electrical circuit associated with the first slot including first and second electrically conductive elements, which are spaced apart from one another to form a gap therebetween. The electrical circuit is configured to switch between an open configuration in which the gap is unbridged and a closed configuration in which an electrically conductive material spans the gap, electrically connecting the first and second electrically conductive elements. The system is configured to detect removal of a first cartridge from the first slot based on whether the electrical circuit is in the open or the closed configuration. The system is configured to generate a signal when removal of the first cartridge is detected.

16 Claims, 13 Drawing Sheets



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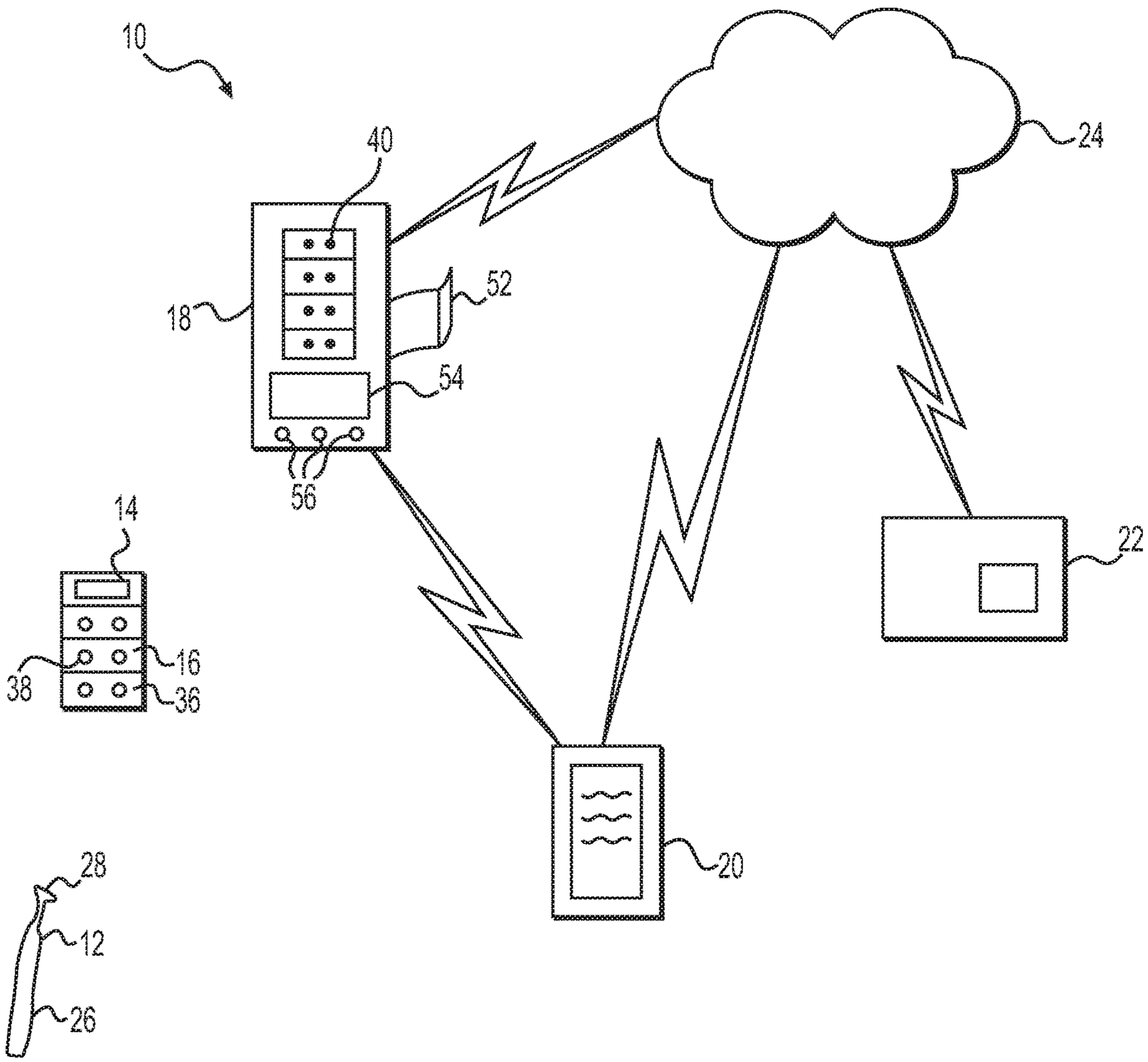


FIG. 1

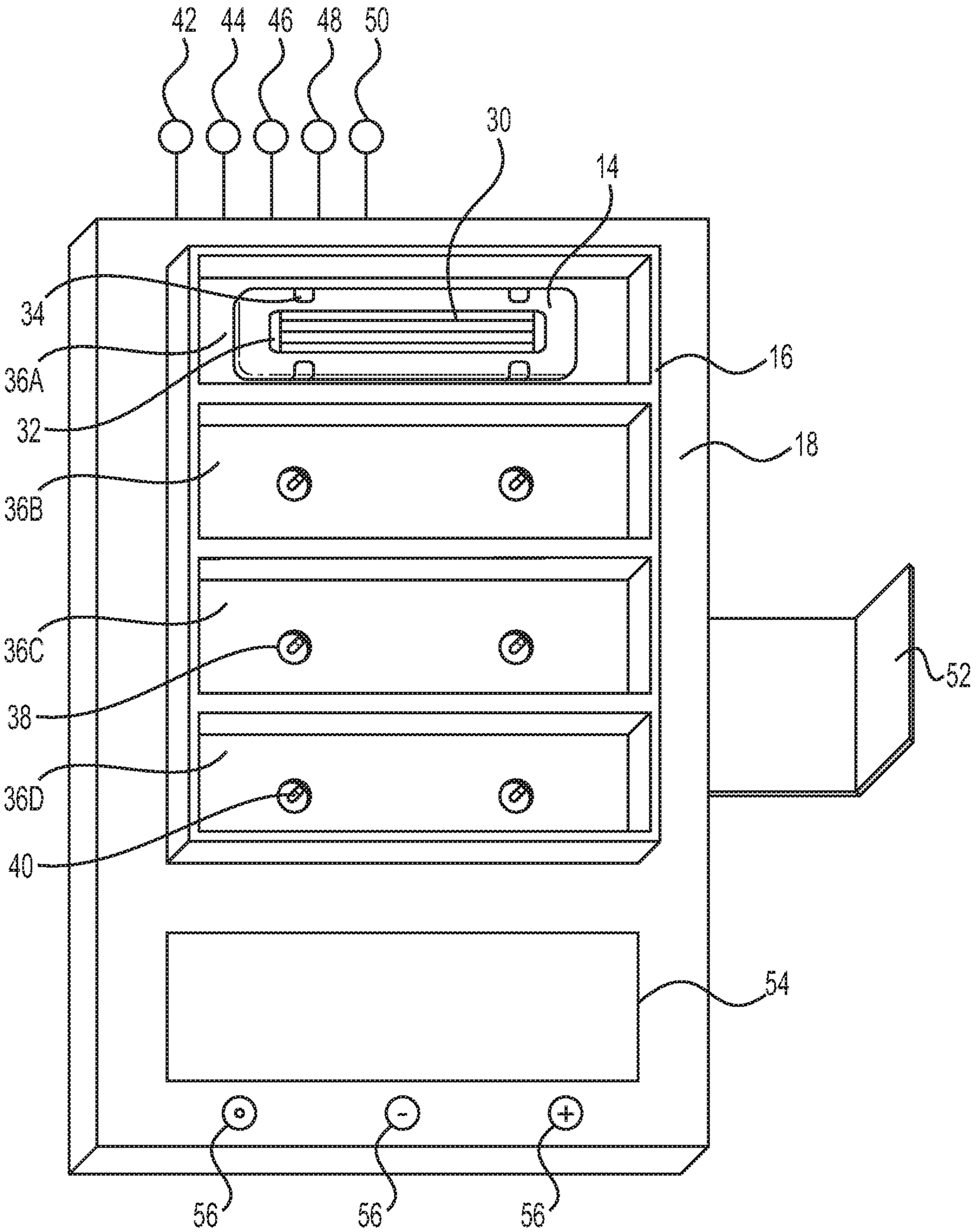


FIG. 2A

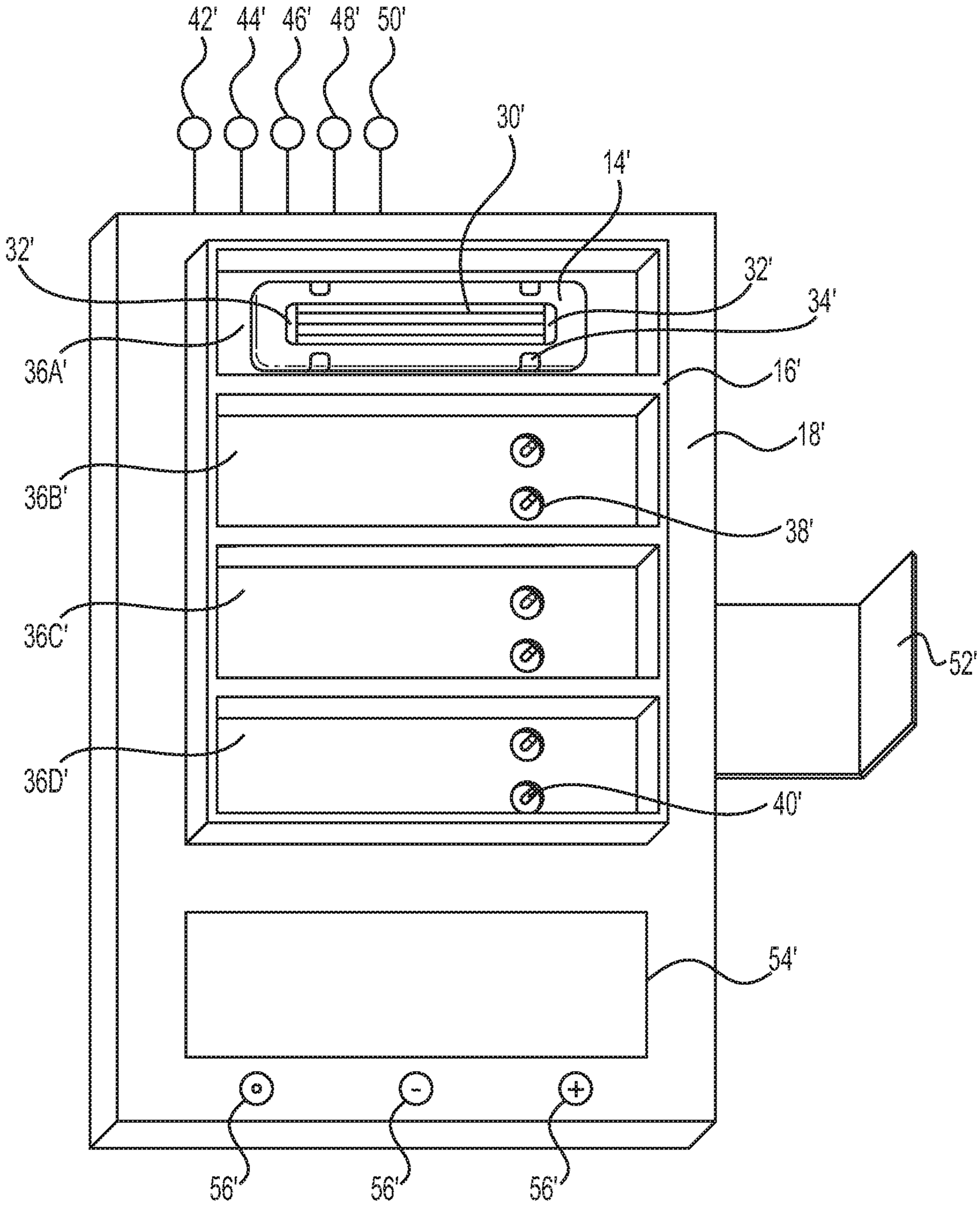

42'
44'
46'
48'
50'
30'
14'
32'
32'
34'
36A'
16'
18'
36B'
38'
36C'
52'
36D'
40'
54'
56'
56'
56'

FIG. 2B

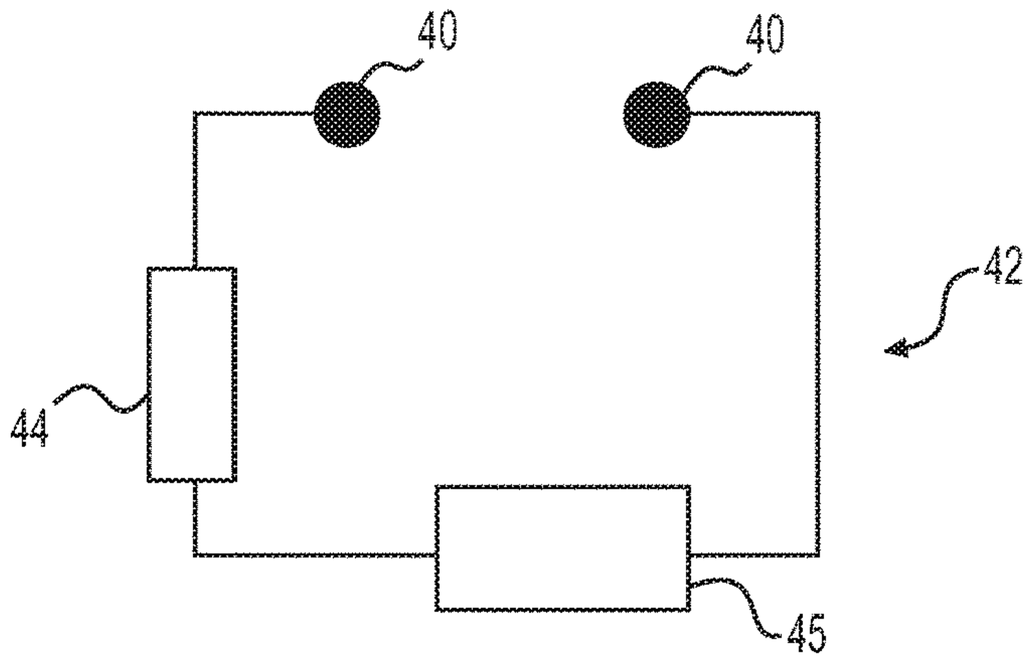


FIG. 3A

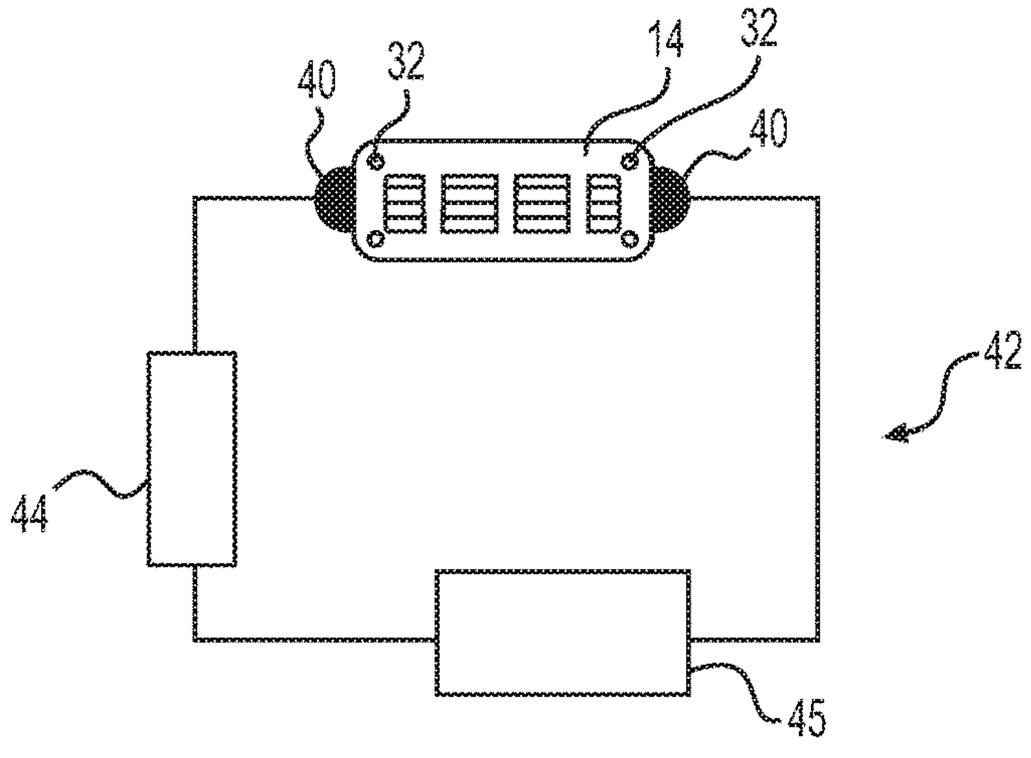


FIG. 3B

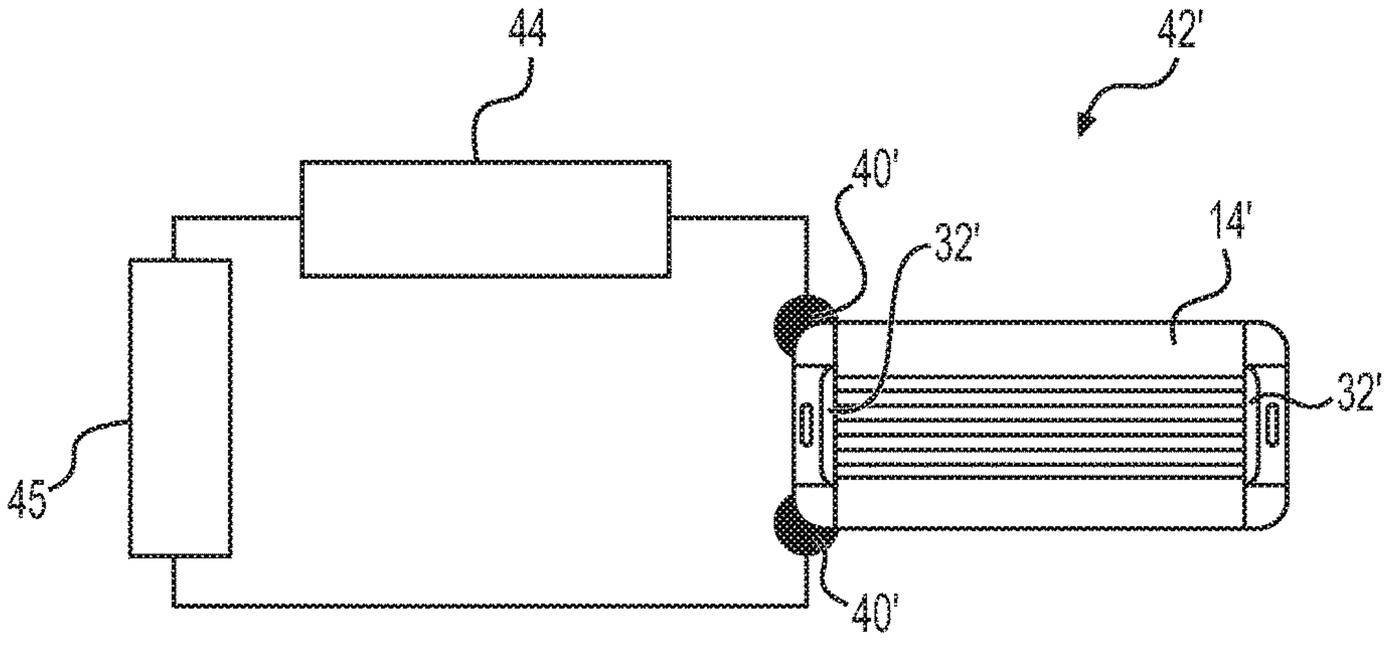


FIG. 3C

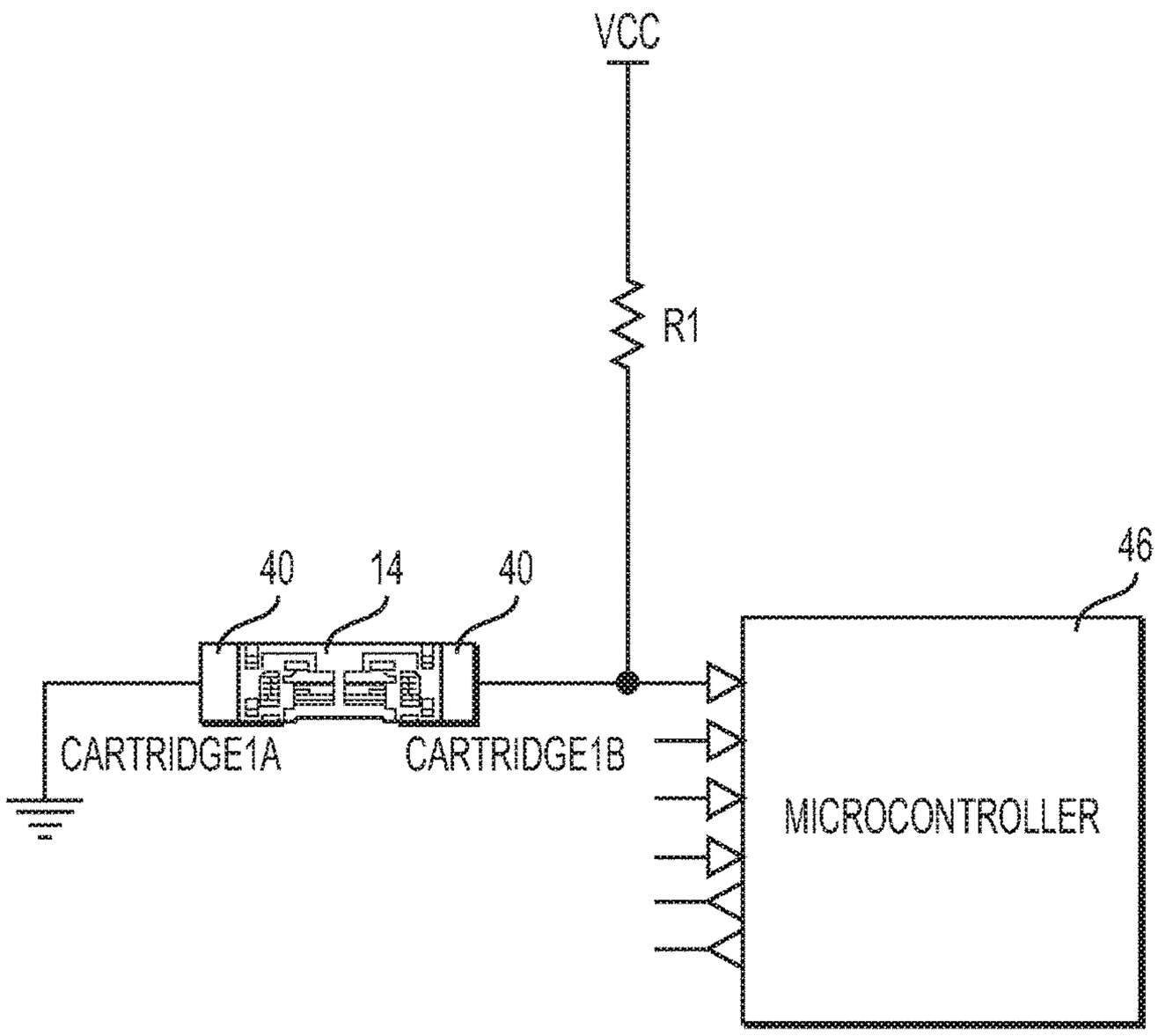

VCC
R1
40
14
40
46
CARTRIDGE1A
CARTRIDGE1B
MICROCONTROLLER

FIG. 3D

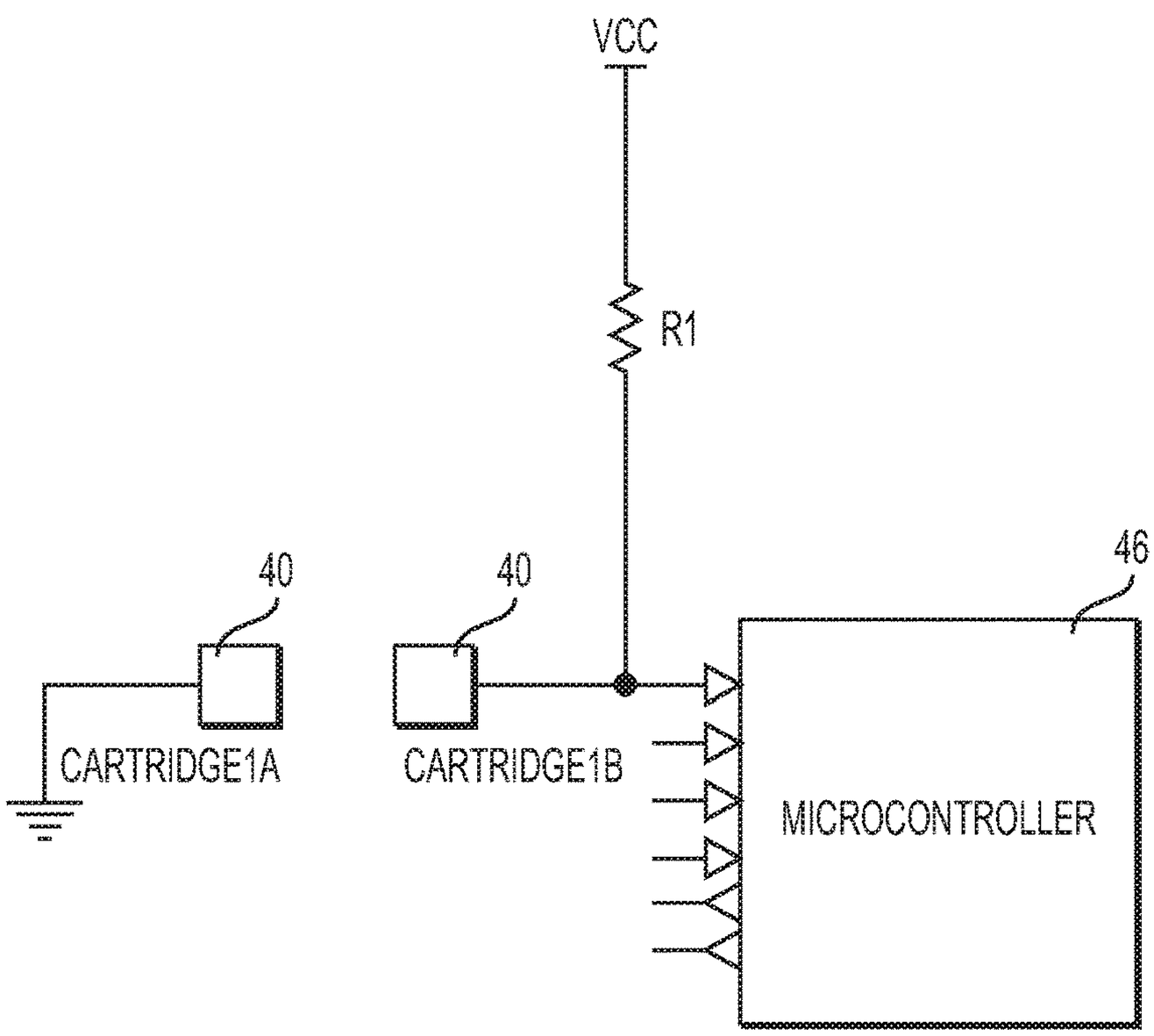

VCC
R1
40
40
46
CARTRIDGE1A
CARTRIDGE1B
MICROCONTROLLER

FIG. 3E

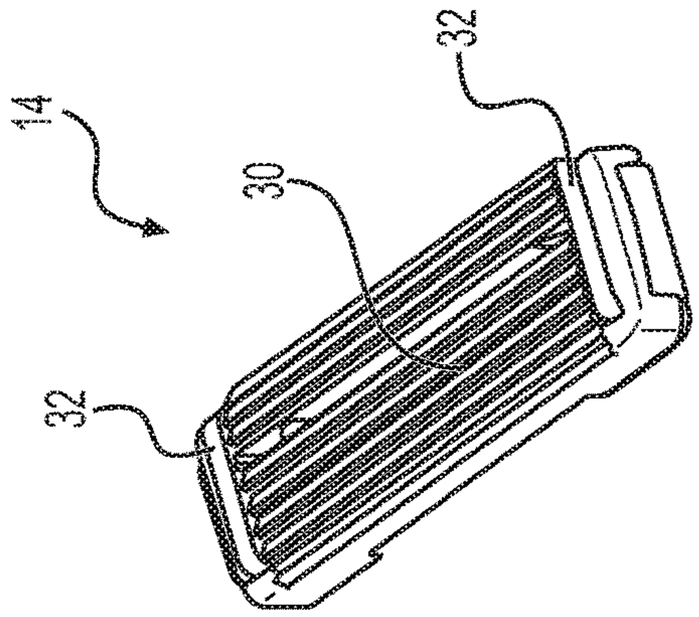


FIG. 4C

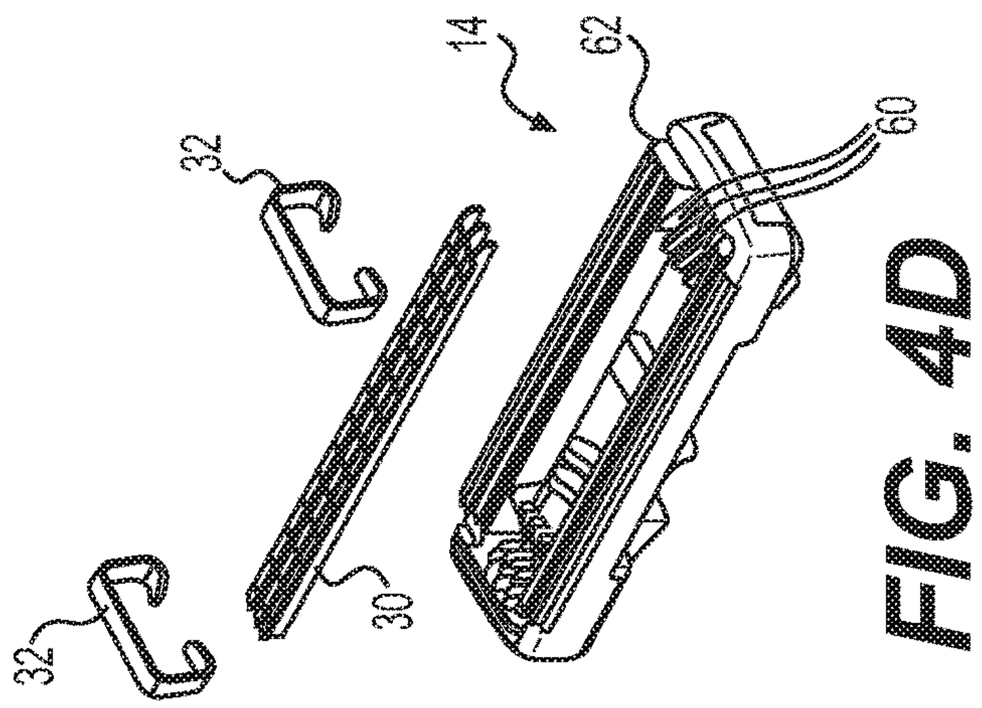


FIG. 4D

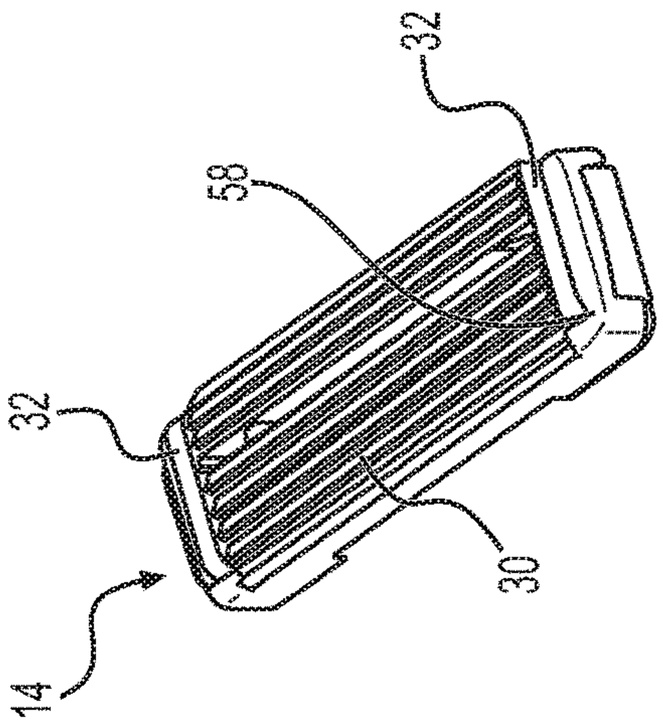


FIG. 4A

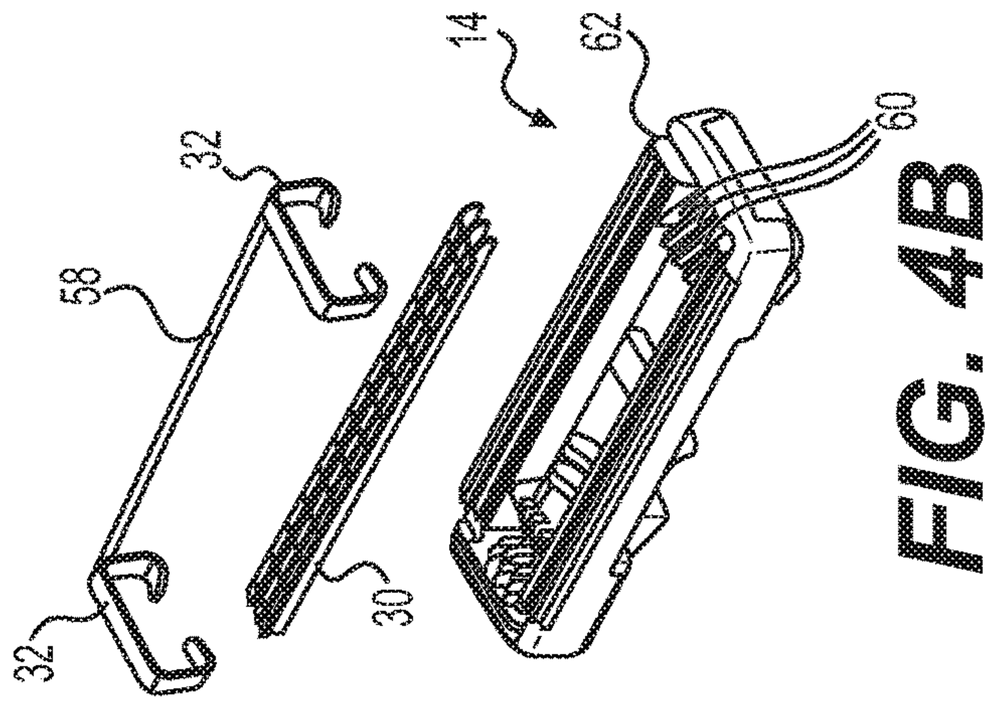


FIG. 4B

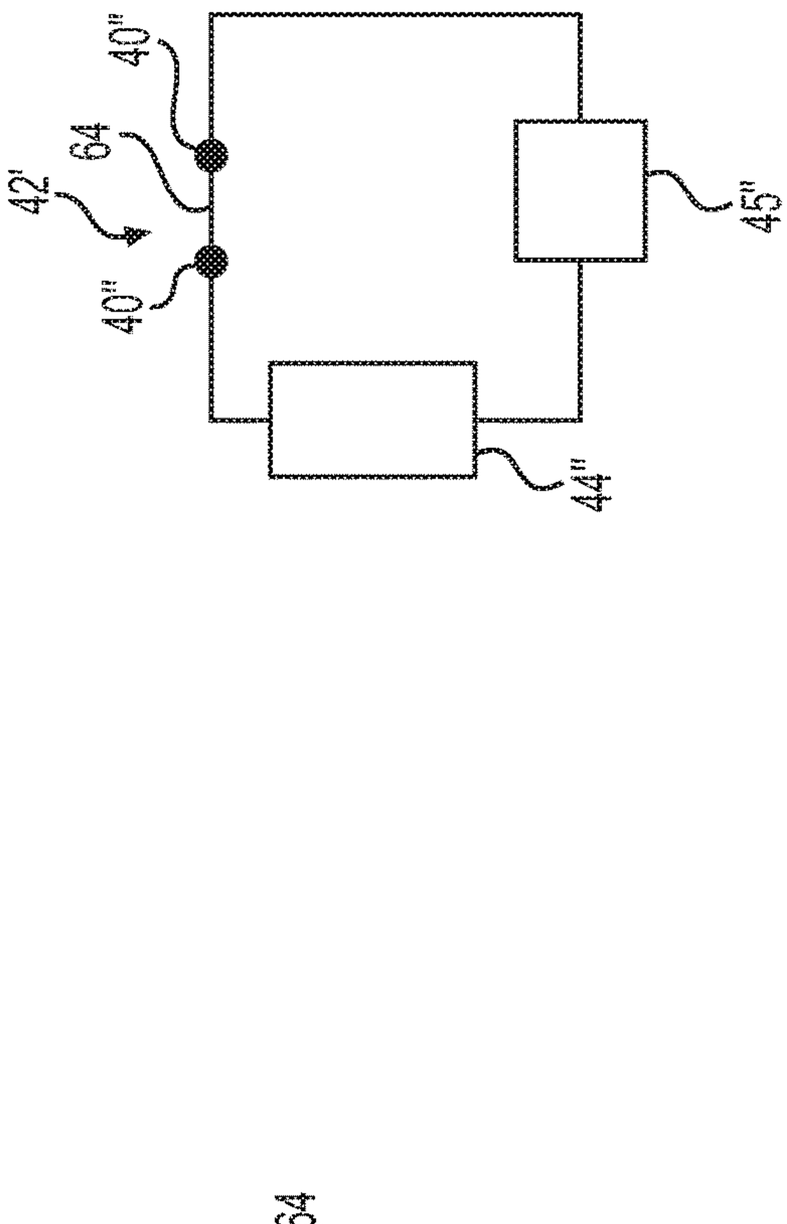


FIG. 5A

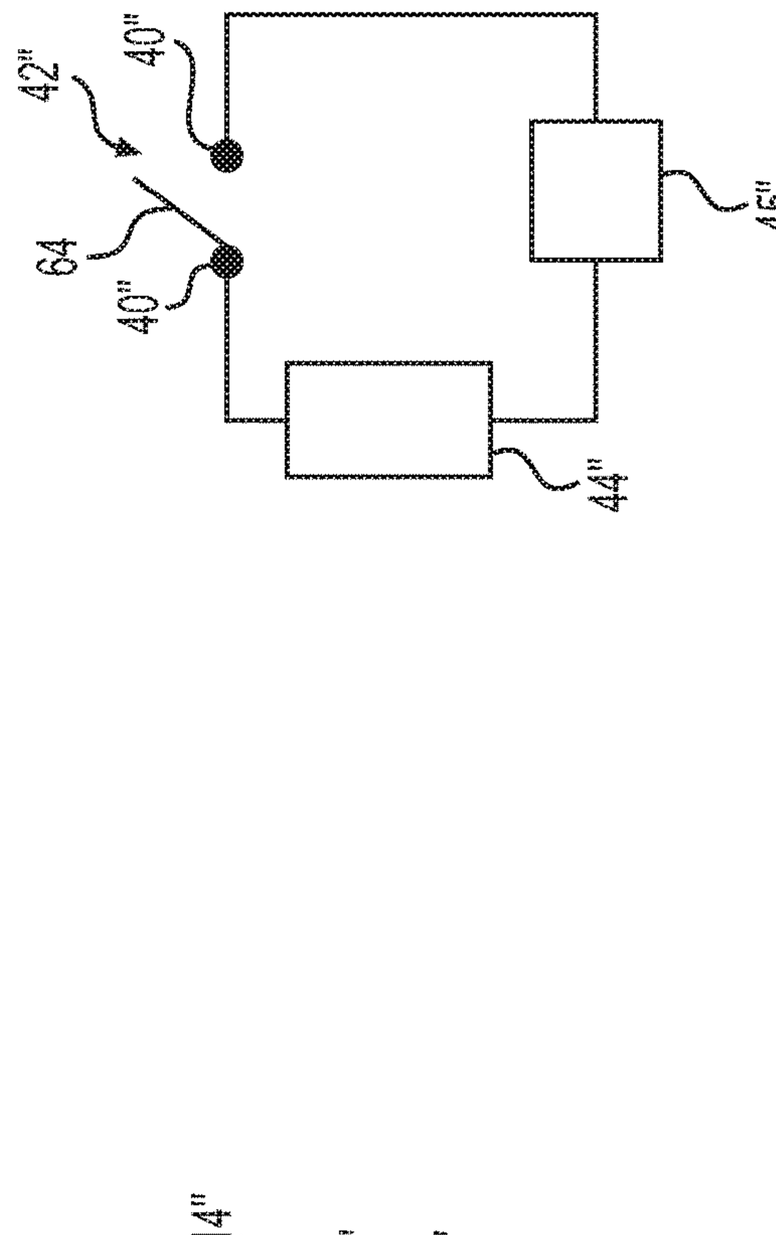
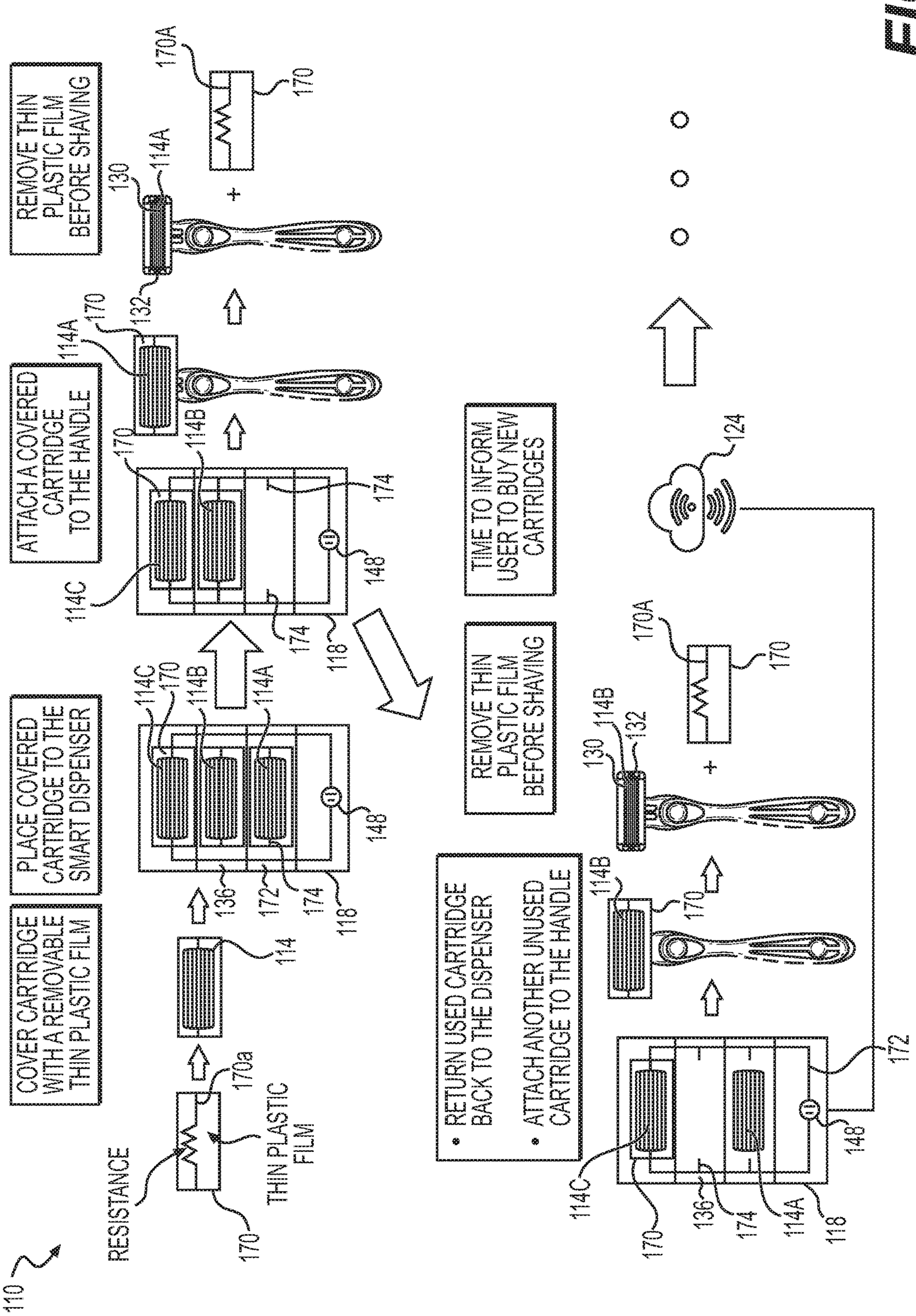


FIG. 5C

FIG. 5D

FIG. 5B

FIG. 6


110
COVER CARTRIDGE WITH A REMOVABLE THIN PLASTIC FILM
PLACE COVERED CARTRIDGE TO THE SMART DISPENSER
ATTACH A COVERED CARTRIDGE TO THE HANDLE
REMOVE THIN PLASTIC FILM BEFORE SHAVING
TIME TO INFORM USER TO BUY NEW CARTRIDGES
• RETURN USED CARTRIDGE BACK TO THE DISPENSER
• ATTACH ANOTHER UNUSED CARTRIDGE TO THE HANDLE
RESISTANCE
THIN PLASTIC FILM
170
170A
170a
114
114A
114B
114C
118
124
130
132
136
148
172
174

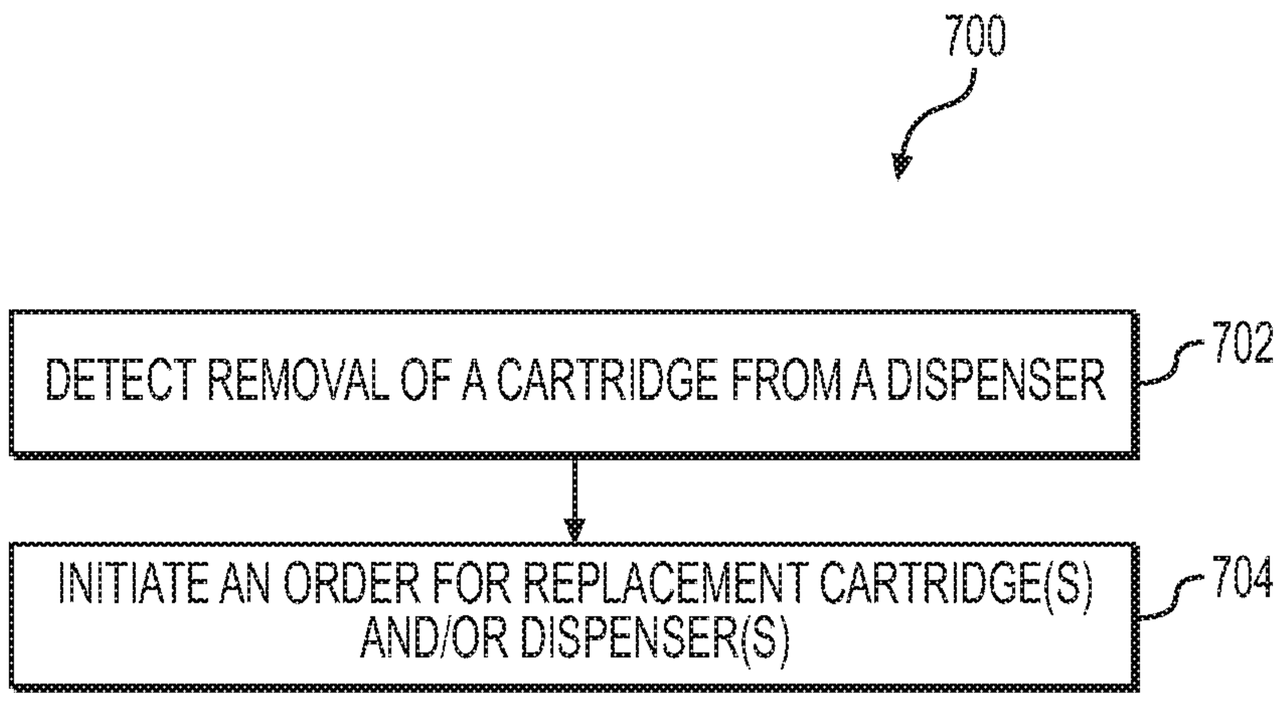

700
DETECT REMOVAL OF A CARTRIDGE FROM A DISPENSER
702
INITIATE AN ORDER FOR REPLACEMENT CARTRIDGE(S) AND/OR DISPENSER(S)
704

FIG. 7A

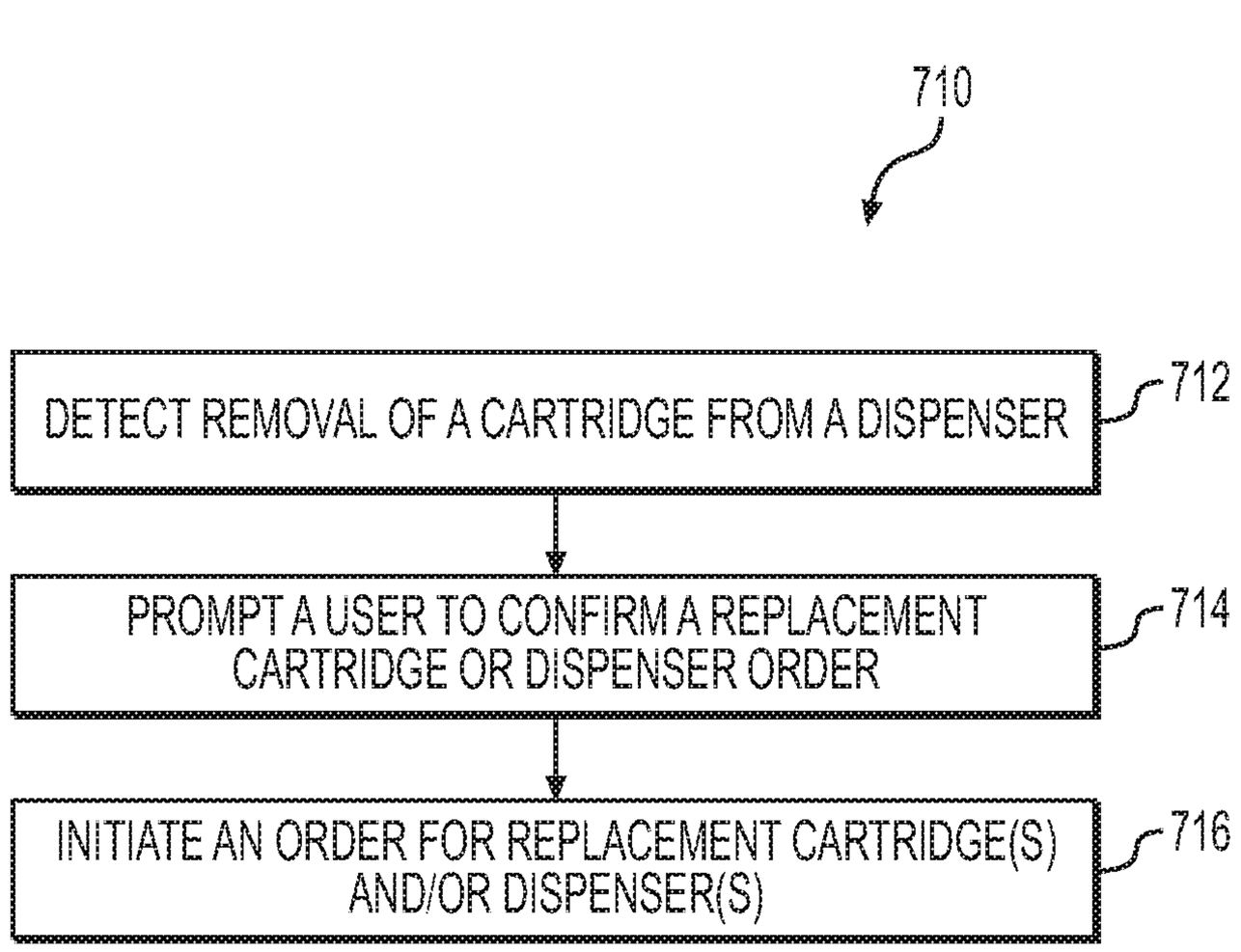

710
DETECT REMOVAL OF A CARTRIDGE FROM A DISPENSER
712
PROMPT A USER TO CONFIRM A REPLACEMENT CARTRIDGE OR DISPENSER ORDER
714
INITIATE AN ORDER FOR REPLACEMENT CARTRIDGE(S) AND/OR DISPENSER(S)
716

FIG. 7B

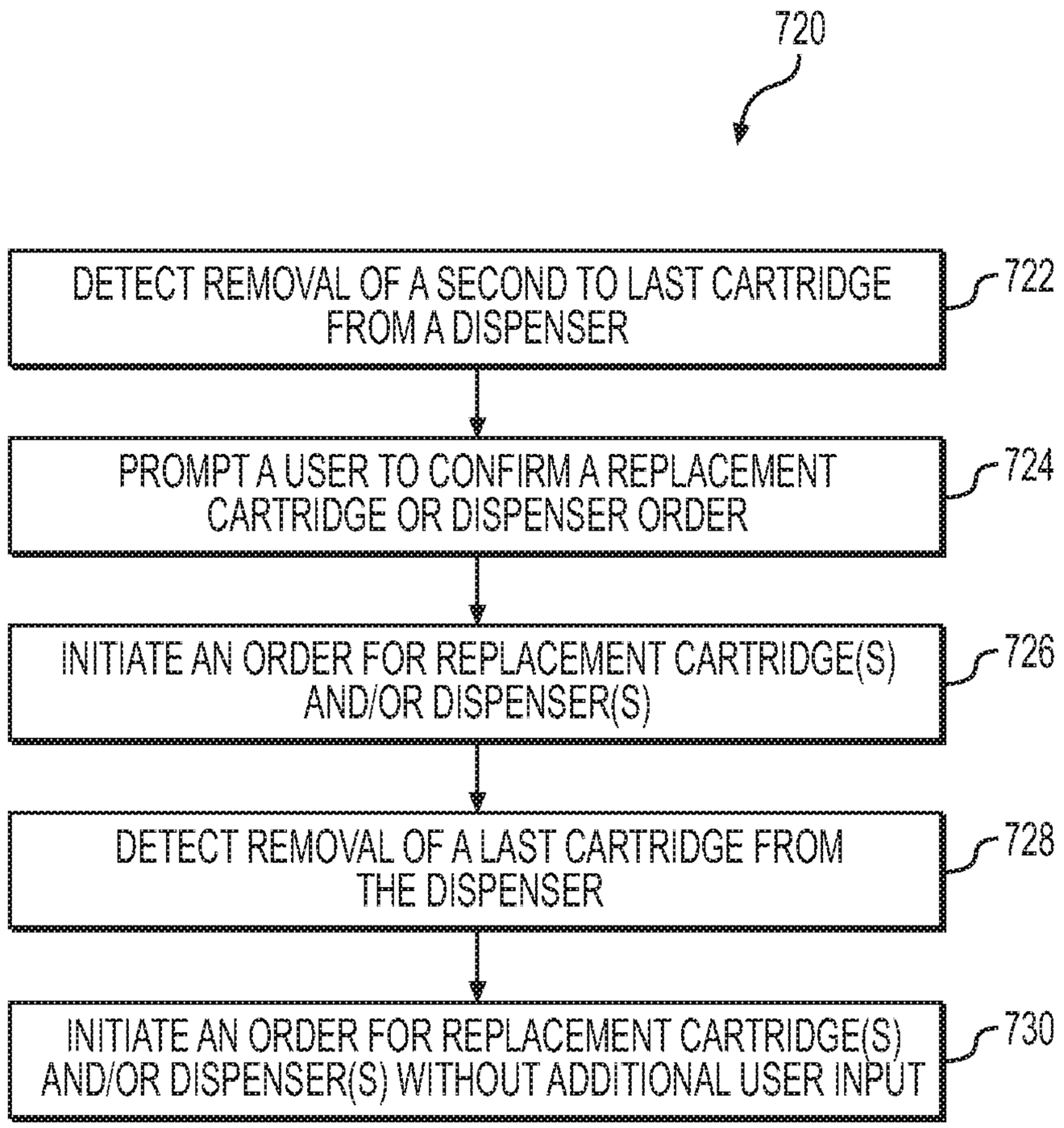

720
DETECT REMOVAL OF A SECOND TO LAST CARTRIDGE FROM A DISPENSER
722
PROMPT A USER TO CONFIRM A REPLACEMENT CARTRIDGE OR DISPENSER ORDER
724
INITIATE AN ORDER FOR REPLACEMENT CARTRIDGE(S) AND/OR DISPENSER(S)
726
DETECT REMOVAL OF A LAST CARTRIDGE FROM THE DISPENSER
728
INITIATE AN ORDER FOR REPLACEMENT CARTRIDGE(S) AND/OR DISPENSER(S) WITHOUT ADDITIONAL USER INPUT
730

FIG. 7C

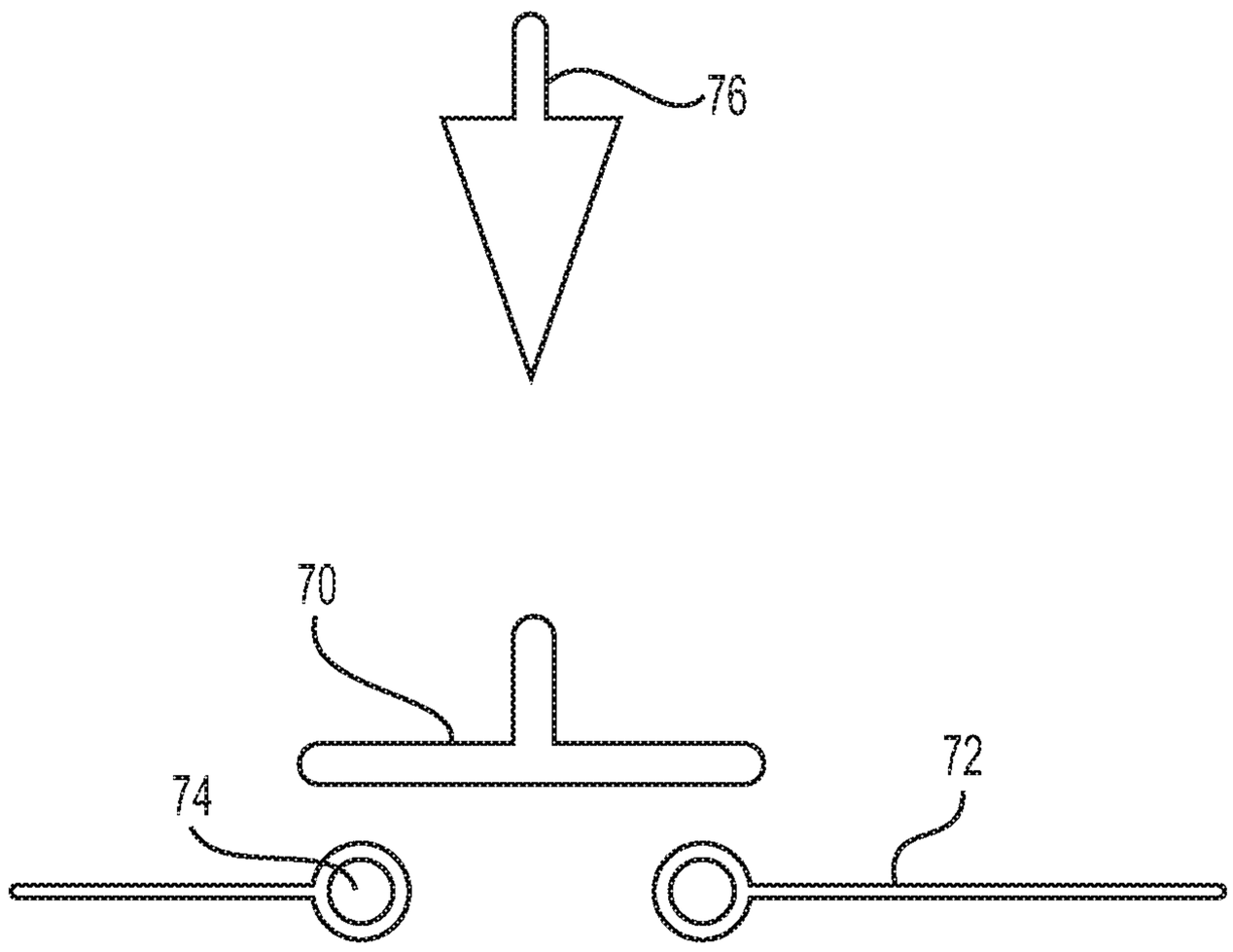


FIG. 8A

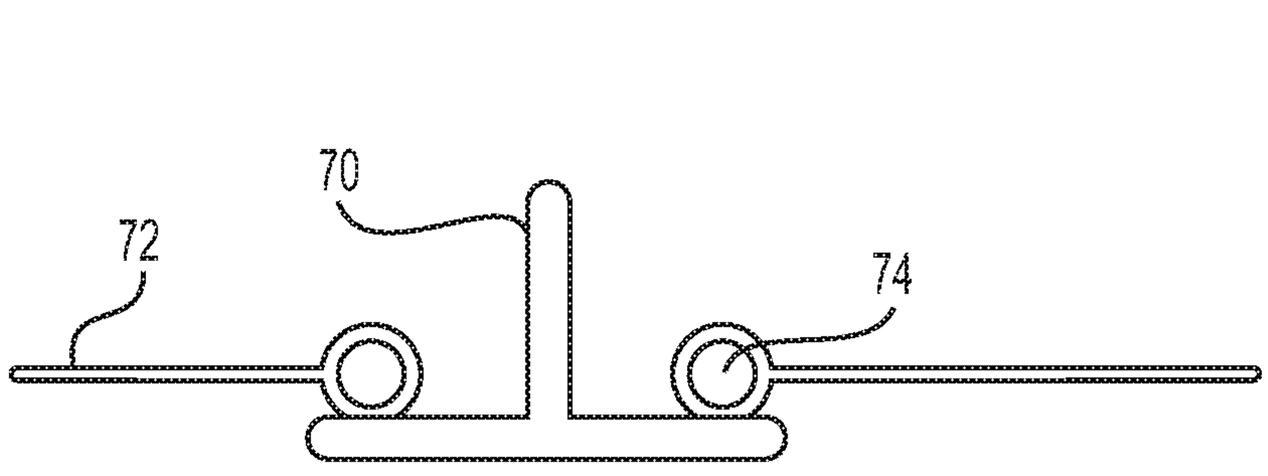


FIG. 8B

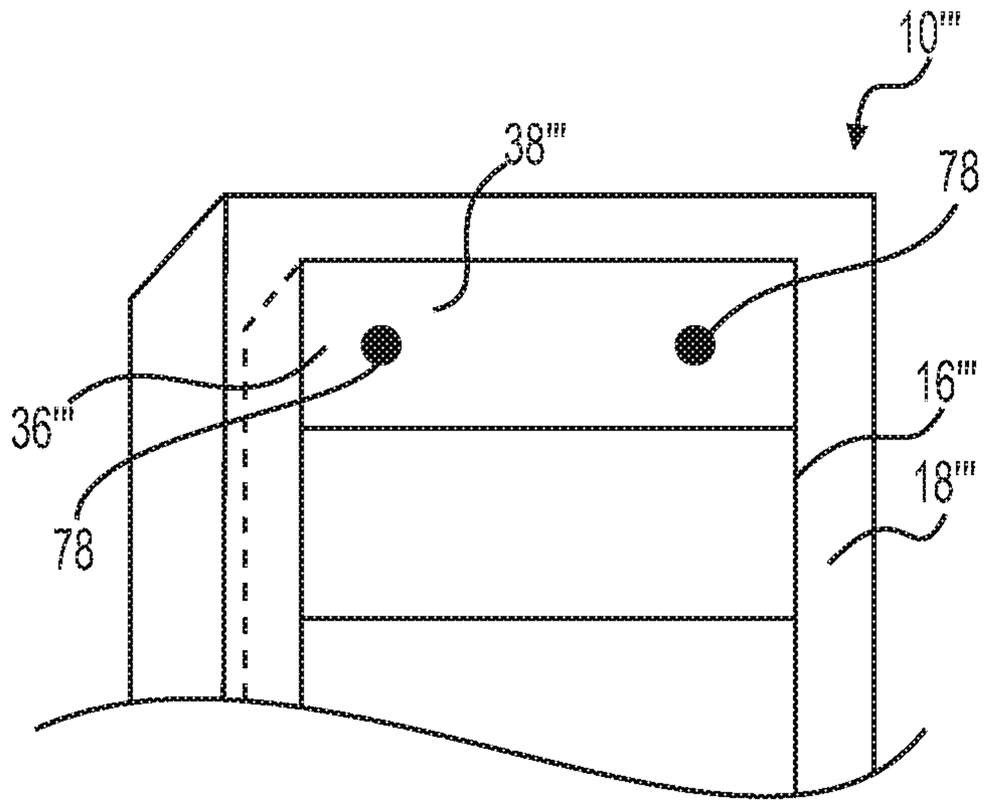


FIG. 9A

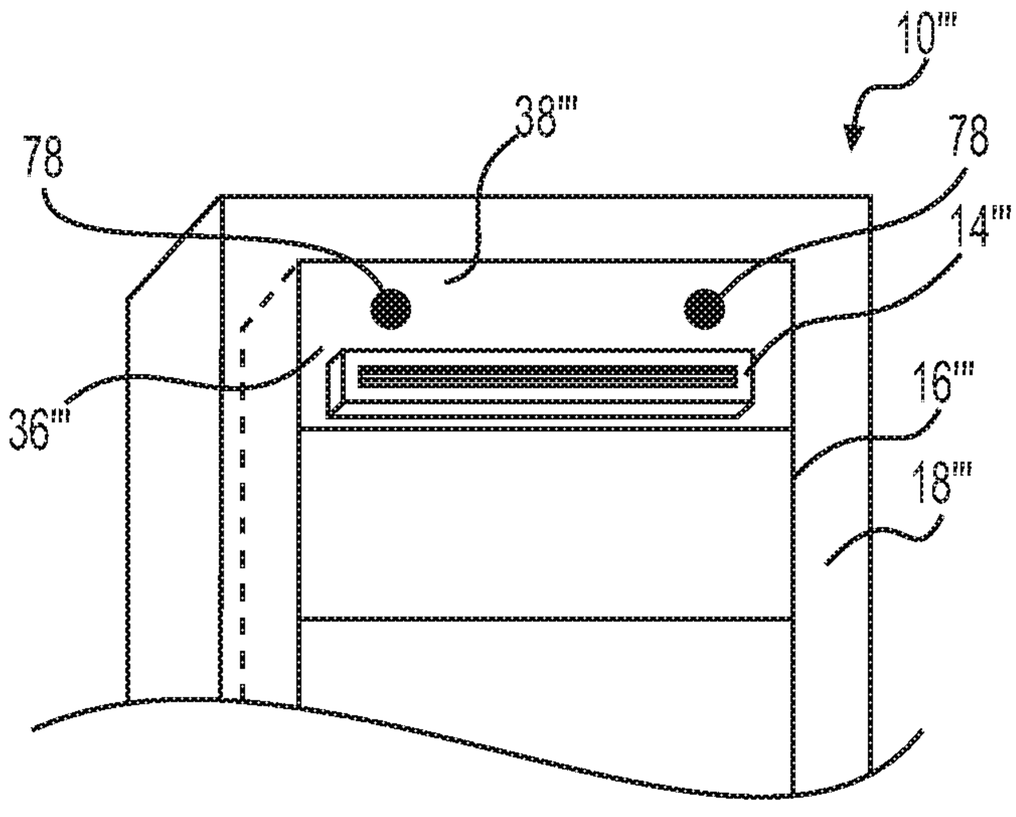


FIG. 9B

SMART DISPENSER SYSTEM AND METHODS OF USE

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a National Stage Application of International Application No. PCT/EP2018/064449, filed Jun. 1, 2018, now published as WO2019001895, and which claims the benefit of U.S. Provisional Application No. 62/526,687, filed Jun. 29, 2017.

TECHNICAL FIELD

Various aspects of the present disclosure relate generally to embodiments of systems and methods for a smart dispenser system. More particularly, the present disclosure describes embodiments of systems and methods for monitoring razor cartridges in a dispenser system, the use of those razor cartridges, and refilling or otherwise replenishing used razor cartridges or razor cartridges otherwise removed from the dispenser system.

DESCRIPTION OF RELATED TECHNOLOGY

Typical shavers include a handle and a razor cartridge, with the razor cartridge including at least one blade configured to shave hair. After a certain number of uses, the razor cartridge blades may, e.g., become dull or otherwise unsuitable for continued shaving, and the cartridge may be discarded and replaced with another cartridge (e.g., a new cartridge) having relatively sharp or otherwise unused blades. The replacement cartridge may be provided in a dispenser or tray. Even though it is common knowledge that a razor cartridge has a certain usage lifetime, most users do not carefully track their razor cartridge usage, especially since the usage lifetime may vary by user based on, e.g., the shaving habits of a user and/or the characteristics of the hair of a user (e.g., thickness, coarseness, density, etc.). As a result, cartridges with blade(s) that are still sufficiently sharp for comfortably obtaining a good shave may often be discarded prematurely, or cartridges that are too dull may continue to be used, albeit with potentially reduced comfort, less than desirable results, or both. Moreover, razor cartridges often are packaged and sold in dispensers, with the dispensers containing anywhere from at least two to a multitude of razor cartridges, for example, ten razor cartridges. After a user has used and discarded the last razor cartridge in the dispenser, the user must then purchase an additional dispenser of razor cartridges.

Both the foregoing general description and the following detailed description are exemplary and explanatory only and are not restrictive of the features, as claimed. As used herein, the terms "comprises," "comprising," or other variations thereof, are intended to cover a non-exclusive inclusion such that a process, method, article, or apparatus that comprises a list of elements does not include only those elements, but may include other elements not expressly listed or inherent to such a process, method, article, or apparatus. Additionally, the term "exemplary" is used herein in the sense of "example," rather than "ideal." Further, the terms "first," "second," and so on are used herein to refer to an exemplary object in a group of one or more objects and are not used to denote numeric order, relative location, or superiority within that group of objects, unless otherwise specified. It should be noted that all numeric values disclosed or claimed herein (including all disclosed values, limits, and ranges) may have a variation of +/−10% (unless a different variation is specified) from the disclosed numeric value. Moreover, in the claims, values, limits, and/or ranges means the value, limit, and/or range +/−10%.

SUMMARY OF THE DISCLOSURE

A shaving system may include a dispenser including a plurality of slots, a first of which may be configured to releasably receive a cartridge having at least one razor blade. An electrical circuit associated with the first slot may include first and second electrically conductive elements, which may be spaced apart from one another to form a gap therebetween. The electrical circuit may be configured to switch between an open configuration in which the gap is unbridged and a closed configuration in which an electrically conductive material spans the gap, electrically connecting the first and second electrically conductive elements. The system may be configured to detect removal of a first cartridge from the first slot based on whether the electrical circuit is in the open or the closed configuration. The system may generate a signal when removal of the first cartridge is detected.

Various embodiments of the system may include one or more of the following features. The signal may be configured for transmission to a third party. The signal may be a request for delivery of at least one new cartridge. The system may also include a push button, and depressing or releasing the push button may switch the electrical circuit between the first configuration and the second configuration. The first slot may contain a cartridge therein. At least a portion of the cartridge contained within the first slot may span the gap between the first electrically conductive element and the second electrically conductive element, electrically connecting the first electrically conductive element and the second electrically conductive element and placing the electrical circuit in the closed configuration. The cartridge may include a protective film, and the protective film may be configured to electrically connect the first electrically conductive element and the second electrically conductive element. Presence of the cartridge within the first slot may switch the electrical circuit into the open configuration. The system may also include a docking station configured to receive the dispenser, wherein the electrical circuit is included as part of the docking station.

Embodiments of the present disclosure may also be drawn to a shaving system. The shaving system may include a dispenser including at least one slot, wherein each of the at least one slots is configured to releasably receive a cartridge including at least one blade, and at least one cartridge positioned in the at least one slot. The system may be configured to detect a removal of the at least one cartridge from the at least one slot, and in response to detecting the removal, the system may be configured to generate a signal for transmission to a third party.

Various embodiments of the system may include one or more of the following features. At least one conductive element may be configured to engage a corresponding conductive element of the at least one cartridge when the at least one cartridge is positioned within the at least one slot. The system may be configured to detect the removal of the at least one cartridge from the at least one slot by detecting when the at least one conductive element disengages from the corresponding conductive element on the at least one cartridge. The corresponding conductive element on the at least one cartridge may include a protective film, and the protective film may be configured to electrically couple to

the at least one conductive element. The system may also include at least one electrical circuit, wherein the at least one electrical circuit is configured to switch between an open configuration and a closed configuration, and wherein presence of the cartridge within the first slot switches the electrical circuit into the open configuration. The system may also include at least one electrical circuit, wherein the at least one electrical circuit is configured to switch between an open configuration and a closed configuration, and wherein the system is configured to detect removal of at least one cartridge from at least one of the plurality of slots based on whether the at least one electrical circuit is in the open configuration or the closed configuration. The system may further include a docking station configured to receive the dispenser, wherein the at least one electrical circuit is included as part of the docking station. The system may further include at least one proximity sensor, and the system may be configured to detect the removal of the at least one cartridge from the at least one slot using the at least one proximity sensor. The signal may be a request for delivery of at least one additional cartridge.

Another embodiment of the present disclosure may be drawn to a method of ordering a replacement razor cartridge. The method may include detecting removal of a razor cartridge from a dispenser. Upon detecting the removal of the razor cartridge from the dispenser, the method may include initiating an order for at least one replacement razor cartridge.

Various embodiments of the system may include one or more of the following features. Detecting the removal of the razor cartridge from the dispenser may include at least one of: (i) detecting whether at least one circuit associated with the dispenser is in an open configuration or a closed configuration, or (ii) detecting whether the razor cartridge is within proximity of at least one proximity sensor associated with the dispenser. Initiating the order for the at least one replacement razor cartridge may include generating a signal and transmitting the signal. Initiating the order for at least one replacement razor cartridge may include initiating an order for a replacement dispenser containing a plurality of replacement razor cartridges.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate various exemplary embodiments and together with the description, serve to explain the principles of the disclosure. There are many aspects and embodiments described herein. Those of ordinary skill in the art will readily recognize that the features of a particular aspect or embodiment may be used in conjunction with the features of any or all of the other aspects or embodiments described in this disclosure.

FIG. **1** illustrates an exemplary smart shaver system, including a dispenser for razor cartridges, according to aspects of the present disclosure.

FIGS. **2**A and **2**B illustrate arrangements of a docking station, a dispenser, and a razor cartridge, according to aspects of the present disclosure.

FIGS. **3**A-**3**C illustrate various electrical circuits to sense the presence or absence of a razor cartridge, according to aspects of the present disclosure.

FIGS. **3**D and **3**E illustrate use of a microprocessor configuration to sense the presence or absence of a razor cartridge, according to aspects of the present disclosure.

FIGS. **4**A-**4**D illustrate various exemplary razor cartridge assemblies, according to aspects of the present disclosure.

FIGS. **5**A and **5**C illustrate perspective views of a docking station, a dispenser, and a razor cartridge.

FIGS. **5**B and **5**D illustrate additional aspects of various electrical circuits to sense or detect the presence or absence of a razor cartridge, according to the present disclosure.

FIG. **6** illustrates an exemplary docking station, a dispenser, a handle, razor cartridges, and a protective film, according to further aspects of the present disclosure.

FIGS. **7**A-**7**C are flow diagrams of exemplary methods for receiving information related to usage and order placement of razor cartridges, according to aspects of the present disclosure.

FIGS. **8**A and **8**B illustrate additional aspects of various electrical circuits to sense or detect the presence, absence, or misalignment of a razor cartridge, according to the present disclosure.

FIGS. **9**A and **9**B illustrate additional aspects of various sensors to detect the presence, absence, or misalignment of a razor cartridge, according to the present disclosure.

DETAILED DESCRIPTION

Examples of the present disclosure include systems and methods to facilitate razor cartridge usage and/or ordering. For example, aspects of the present disclosure may provide a user with the ability to more easily identify degradation of a razor cartridge and more simply obtain replacement razor cartridges to, e.g., continue shaving without additional human intervention to purchase or otherwise procure replacement cartridges. More specifically, certain aspects of the present disclosure describe a smart razor cartridge refill system and method configured to automatically order replacement razor cartridges via the internet from an e-commerce business without user intervention or with minimal user intervention.

Reference now will be made in detail to examples of the present disclosure described above and illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

According to aspects, as detailed in FIG. **1**, a system **10** includes a handle **12**, at least one cartridge **14**, a dispenser **16** configured to retain the cartridge **14**, and a docking station **18**. The system **10** may also include a user device **20** configured to transmit and receive information to and from the docking station **18** and a third party or resource such as a merchant unit **22** via the internet **24**. The docking station **18**, user device **20**, and merchant unit **22** may each be configured to receive, transmit, or receive and transmit data signals through wired or wireless connections such as, for example, through the internet **24** or Bluetooth™.

The handle **12** may include a handle body **26** configured to be held by a user. The handle body **26** may include any suitable configuration to promote comfortable gripping by a user. For example, the handle body **26** may include coatings or coverings such as a rubber covering, or may contain geometric features to prevent the handle **12** from slipping within a hand of the user especially when the handle **12** may be wet. The handle **12** may also include a handle attachment interface **28** at one end of handle body **26**. The handle attachment interface **28** may be configured to selectively attach and release the cartridge **14** to/from the handle **12** through any mechanism known for attaching and releasing a disposable cartridge with a shaving handle.

According to further aspects, as shown in FIG. **2**A, the cartridge **14** may be received or otherwise stored in the dispenser **16**. The dispenser **16** will be described in greater

detail below. The cartridge **14** may include any number of razor blades **30**, which may include a trimmer blade (not shown). As discussed in more detail below, the cartridge **14** may include blade securing elements **32** that secure the razor blades **30** in the cartridge **14**. The blade securing elements **32** may be conductive or may be insulating. Blade securing elements **32** may be insulated by, e.g., a coating such as polytetrafluoroethylene. According to some aspects, the cartridge **14** may include an additional conductive element (not shown) configured to electrically connect conductive elements in the docking station **18**, as discussed in more detail below. Moreover, razor blades **30** may be conductive or may be insulating. The cartridge **14** may also include a handle coupling portion **34** configured to releasably engage handle attachment interface **28** such that the cartridge **14** may be selectively coupled to and released from the handle **12**.

According to some aspects, the dispenser **16** and docking station **18** may be separate elements, as shown in FIG. **1**. The docking station **18** may receive the dispenser **16**, as shown in FIG. **2**A. However, according to further aspects, the dispenser **16** and docking station **18** may instead be made an integral one-piece construction. It is noted that any discussion herein referring to the dispenser **16** and docking station **18** as separate elements equally applies to arrangements where the dispenser **16** and docking station **18** are constructed as a single unit via a one-piece construction, or where the dispenser **16** and docking station **18** are constructed as discrete components physically connected together, regardless of whether such connection is permanent or releasable. According to some aspects, the docking station **18** and dispenser **16** may be physically separated from one another, but operatively coupled together for the purposes of receiving and/or transmitting data such as, for example, via a wired or wireless interface. As such, the docking station **18** and dispenser **16** may be provided with suitable electronics and interfaces to facilitate the reception and transmission of data.

The dispenser **16** may include a plurality of slots **36** (e.g., slots **36**A-**36**D), wherein each slot **36** may receive a cartridge **14**. For example, the dispenser **16** may include four slots **36** to hold four cartridges **14**. Although four slots **36** are depicted in FIG. **2**A, those of ordinary skill in the art will understand that the dispenser **16** may include a greater or lesser number of slots **36**. According to some aspects, the dispenser **16** may include a number of slots **36** equal to a number of cartridges **14** stored in the dispenser **16**. According to other aspects, the dispenser **16** may include a number of slots **36** greater than or less than the number of cartridges **14** stored in the dispenser **16**. For example, the dispenser **16** may include five cartridges **14** and six slots **36**, one additional slot **36** so that a user may store a used cartridge **14** in the dispenser **16** before removing one of the other five cartridges **14**.

The slots **36** may be any suitable shape configured to receive a particular type of cartridge **14**. Alternatively, slots **36** may be a generic shape such that slots **36** may be configured to receive multiple types of cartridges **14**. Moreover, slots **36** may include a biasing, a snap-fit, and/or a sliding configuration in order to securely retain the cartridges **14** before the cartridges **14** are removed by a user from the dispenser **16**. The biasing, snap-fit, and/or sliding configurations may prevent the cartridges **14** from inadvertently falling out of the dispenser **16**, such as, for example, during shipping or if the dispenser falls off a bathroom counter. According to some aspects, where the dispenser **16** and docking station **18** may be separate elements, the dispenser **16** may include openings **38** within slots **36** beneath the cartridges **14**. The openings **38** may include any suitable configuration, shape, and/or dimension. The openings **38** will be described in greater detail below. Although FIG. **2**A depicts two openings **38** within each slot **36**, those of ordinary skill in the art will understand that one or more slots **36** may include one opening **38**, no opening **38** at all, or greater than two openings **38**.

The docking station **18** may be sized to receive the dispenser **16** within, partially within, or on top of a surface of the docking station **18**. The docking station **18** may include conductive elements or contacts, such as conductive pins **40**. Though the present disclosure contemplates that conductive pins **40** may extend into one or more slots **36**, as described below, those of ordinary skill in the art will recognize that conductive pins **40** may include conductive surfaces positioned on a bottom surface of one or more slots **36**.

As detailed in FIG. **2**A, for example, the conductive pins **40** may be configured to extend through openings **38** when the dispenser **16** is mounted on the docking station **18**. The conductive pins **40** may then be in contact with the blade securing elements **32** or another conductive element of each cartridge **14** when the cartridge **14** is within a slot **36** of the dispenser **16**, as will be described below in greater detail. The contact between conductive pins **40** with blade securing elements **32** or another conductive element may complete a circuit, and the removal of the cartridge **14** from the slot **36** may break the contact, and thus open the circuit. According to other aspects, the razor blades **30** may be conductive, such that contact between conductive pins **40** with razor blades **30** may complete a circuit, and the removal of the cartridge **14** from the slot **36** may break the contact, and thus open the circuit. According to further aspects, both the blade securing elements **32** and razor blades **30** may be conductive, and contact between the conductive pins **40** with either the blade securing elements **32** and/or the razor blades **30** may compete a circuit, with current flowing through the blade securing elements **32** and/or the razor blades **30**.

Hence, the presence of the cartridge **14** in the slot **36** and contact with the conductive pins **40** simulates an ON-switch operation. Similarly, the removal of the cartridge **14** from the slot **36** and/or when at least one conductive pin **40** is not in contact with a conductive element of cartridge **14** simulates an OFF-switch operation. Even though the cartridge **14** (e.g., the blade securing elements **32**, razor blades **30**, and/or another conductive element) may not be an ideal conductor (e.g., may have a resistance between approximately 1 ohm and approximately 1000 ohms), the cartridge **14** may still simulate an ON/OFF-switch operation. A certain amount of current may flow between the conductive pins **40** (i.e., the circuit is closed) in the ON-switch operation, and current may not flow between the conductive pins **40** (i.e., the circuit is open) in the OFF-switch operation.

The openings **38** and conductive pins **40** may have an arrangement different than the arrangements as shown in FIGS. **1** and **2**A. For example, the openings **38** and conductive pins **40** may have any position that allows contact with the blade securing elements **32** or another conductive element in the cartridge **14** when cartridge **14** is received in the slot **36**. According to some aspects, the openings **38** and/or conductive elements or pins **40** may be positioned in only one slot **36** or a subset of slots **36**, or each slot **36**. For example, each slot **36** may include one or more openings **38**. More particularly, the openings **38** and/or conductive pins **40** may be positioned in only the first slot **36**A, second slot **36**B, third slot **36**C, or in only last slot **36**D. For example, each of slots **36**A-**36**D may include openings **38**, but only one of the

slots **36**A-**36**D may include conductive pins **40**. According to further aspects, the openings **38** and conductive pins **40** may be positioned in the first slot **36**A and last slot **36**D, or the openings **38** and conductive pins **40** may be positioned in the third slot **36**C and last slot **36**D. Hence, the openings **38** and/or conductive pins **40** may be positioned in each slot **36** or any combination of at least one slot **36**. According to further aspects, where the dispenser **16** and docking station **18** may be one integral element, the conductive pins **40** may be replaced with flat conductive surfaces operably coupled to electronics and other circuitry within the dispenser **16** and/or the docking station **18**.

According to further aspects, FIG. **2**B illustrates another exemplary aspect of an arrangement of the dispenser **16'**, openings **38'** and conductive pins **40'**. The dispenser **16'** of FIG. **2**B may be substantially similar to the dispenser **16** of FIG. **2**A. Specifically, the dispenser **16'** may include one or more of the features described above in connection with the dispenser **16** depicted in FIG. **2**A.

As shown in FIG. **2**B, a pair of openings **38'** and/or a pair of conductive pins **40'** may be positioned in one or more slots **36'** on one side of the dispenser **16'** and docking station **18'**, such as, for example, a right side. According to an aspect, the distance between the pair of openings **38'** and/or the pair of conductive pins **40'** may be less than a length of the conductive blade securing elements **32'**. Moreover, the dispenser **16'** and docking station **18'** may be open on a side opposite to the pairs of openings **38'** and/or conductive pins **40'**, such as, for example, a left side. As such, a user may couple a handle (e.g., handle **12**) to a cartridge **14'** via a handle coupling portion **34'**, and may either slide the cartridge **14'** out of the open side of the dispenser **16'** and docking station **18'** or may otherwise remove the cartridge **14'** from the dispenser **16'**. As shown in FIG. **3**C and discussed in greater detail below, when the cartridge **14'** is positioned fully within the dispenser **16'**, the blade securing elements **32'** or another suitable conductive element may contact the conductive pins **40'** and complete a circuit. The circuit may be complete without current extending across the longitudinal face of the cartridge **14'** or through the blades **30'**. When a user removes the cartridge **14'**, the circuit may be opened because the blade securing elements **32'** may no longer be in contact with the conductive pins **40'**.

With reference to FIGS. **2**A, **2**B, and **3**A-**3**E, the docking station **18** (or the combination of the dispenser **16** or dispenser **16'** and the docking station **18** or docking station **18'**) may further include one or more of a circuit **42**, a battery **44**, an electronic circuit **45**, a microcontroller **46**, a communication unit **48**, and a memory **50**. As alluded to above, when a cartridge **14** is positioned with a slot **36** so as to be in contact with both conductive pins **40**, the circuit **42** (shown in, e.g., FIGS. **3**B and **3**C) may be completed. The conductive pins **40** may be physically separated to be electrically isolated from each other, so the circuit **42** may only be completed when the blade securing elements **32** (or the other conductive elements) may be in contact with both conductive pins **40**. As shown in FIG. **3**C, the conductive pins **40'** may take an arrangement similar to that shown in FIG. **2**B. For example, the conductive pins **40'** and corresponding openings **38'** (if necessary) may be positioned on one side of the slot **36'** such that a blade securing element **32'** (or other suitable conductive element) on the respective side of cartridge **14'** may contact the conductive pins **40'** to complete the circuit **42'**.

The circuit **42** may be powered by the battery **44**. According to some aspects, however, the circuit **42** may be coupled to a separate power source either within the docking station **18** or separate from the docking station **18**. For example, the docking station **18** may be configured to be coupled to a household electrical socket providing electrical energy between 110V-240V. Circuit **42** may also be electrically connected to an electronic circuit **45**, which may include a microcontroller or other suitable electronics associated with the docking station **18**.

As is shown in FIGS. **3**D and **3**E, microcontroller **46** may generate a current and/or measure the current when the circuit **42** is completed. The communication unit **48** may include a wireless or wired internet connection to send and/or receive electronic information. The communication unit **48** may also include a transmitter and/or receiver to exchange electronic information with the user device **20**, for example, a Bluetooth™, AirDrop™, wireless internet, or any other suitable connection now known or that may be similarly developed in the future. The memory **50** may be coupled to the microcontroller **46** and communication unit **48** to store information such as, for example, the number of times the circuit **42** may be open and/or closed based on the placement and/or removal of the cartridge **14** in/from the dispenser **16**. A battery (or any other suitable power source) may power the microcontroller **46**, communication unit **48**, and/or memory **50**. The microcontroller **46**, communication unit **48**, and/or memory **50** may be electronically connected such that information processed by the microcontroller **46** may be transmitted to and from the user device **20** and/or the merchant unit **22**, and also stored or accessed via the memory **50**.

According to some aspects, the docking station **18** may also include a handle holder **52** (shown in, e.g., FIG. **2**A), a display **54**, and an input **56**. The handle holder **52** may extend from or be built into the docking station **18** and may be configured to receive the handle body **26** of the handle **12**. The handle holder **52** may further include a snap or locking mechanism to removably secure the handle **12** to the docking station **18** between uses or during travel. The display **54** may be any suitable display, including, but not limited to, a liquid crystal display (LCD) unit. The display **54** may visually or graphically display information to a user, for example, usage history and/or indications to replace or reorder the cartridges **14**. The display **54** may provide shaving or usage advice or other information to the user. According to further aspects, the docking station **18** may solicit or otherwise request input or feedback from a user via, e.g., the display **54**. For example, information may be displayed during, before or after a shave, or in response to a user input. The input **56** may allow a user to respond to prompts displayed on the display **54**, such as, for example, to confirm a reorder operation. According to some aspects, the input **56** may be touch sensitive, such as, for example, buttons. According to other aspects, however, the input **56** may be replaced with voice-activation technology so that a user may speak commands to the docking station **18**. As such, the docking station **18** may also include a speaker and microphone to provide and receive voice instructions. The input **56** may also allow a user to modify the information displayed on the display **54**, such as, for example, to input user information, to toggle information sets, to change settings, to reset a usage indicator, or to adjust reorder preferences. The input **56** may also include a power switch to turn the electronic components of the docking station **18** on and off. According to further aspects, the display **54** may be touch sensitive such that the user may respond to prompts and/or modify the information presented on the display **54** by simply touching the display **54**.

The user device **20** may be a smartphone, tablet, smartwatch, computer, or other device. The user device **20** may also include a downloadable mobile application. The mobile application may be a user interface for the system **10**, including providing and/or storing information related to the cartridges **14**, dispenser **16**, and docking station **18**, and information related to the user, etc. The mobile application may also be configured to receive information from docking station **18** and/or the merchant unit **22** through the connection between the user device **20** and docking station **18**, or through the connection between the user device **20** and the internet **24**. The mobile application may also transmit information to the merchant unit **22** in order to provide user data, to place replacement orders, etc. The mobile application may also provide the same information and user interaction as discussed above with respect to the display **54** on the docking station **18**.

According to further aspects, the microcontroller **46** may, for example, be a Microchip PIC16F1823 microcontroller working at 2.5V DC with a resistor of approximately 10 Kohms. As is shown in FIGS. **3**D and **3**E, the microcontroller **46** and a pull-up resistor may be connected to one conductive pin **40**, and a ground may be connected to another conductive pin **40**. According to other aspects, a general purpose input-output pin ("GPIO pin") of the microcontroller **46** may be pulled up (i.e., high logic level) (FIG. **3**E) when connected to the resistor which may be either internal pullup (integrated inside the microcontroller) or external as in the FIGS. **3**D-**3**E. Additionally, the GPIO pin of the microcontroller **46** may be pulled down (i.e., low logic level) when conductive pins **40** may be electrically connected, for example, by a conductive element bridging a multitude of conducting pins **40** (FIG. **3**D). When the cartridge **14** connects with the conductive pins **40**, as in FIG. **3**D, current may flow to the ground, eliminating the current flowing to the high logic level through the pull-up resistor and thus pulling down the microcontroller input from high to low logic level. If the cartridge **14** may be removed, however, as shown in FIG. **3**E, no current may flow to the ground because the conductive pins **40** may not be electrically connected, resulting in a higher voltage at the microcontroller input (e.g., pulls up the microcontroller input from low to high logic level). This voltage difference may be used to detect the presence and absence of a cartridge **14** in a slot **36**.

The microcontroller **46** may be connected to, and thus monitor, a plurality of conductive pins **40**, for instance, pairs of conductive pins **40** for each slot **36** of the dispenser **16** coupled to docking station **18**. Each cartridge **14** may act as an electrical conductor having a resistance, so each cartridge **14** may operate as a switch which increases the current to the ground and reduces the input of the microcontroller **46**, reducing the voltage delivered to the microcontroller **46**. If a plurality of cartridges **14** are positioned within dispenser **16**, connecting each pair of conductive pins **40**, then the voltage at microcontroller **46** may be relatively low. However, as cartridges **14** are removed, the voltage at microcontroller **46** may increase, and the voltage at microcontroller **46** will be at the maximum when all of cartridges **14** have been removed. The increases may be incremental and correspond to the number of cartridges **14** in dispenser **16**, providing information that the microcontroller **46** may provide to the memory **50** and transmit to the other devices of the system **10** to track the usage of cartridges **14**.

According to aspects as shown in FIGS. **4**A-**4**D, the blade securing elements **32** may extend generally perpendicularly to a longitudinal axis of the blades **30**. As further shown in FIGS. **4**A and **4**B, a connection portion **58** may extend generally parallel to the blades **30** and may connect two blade securing elements **32**. The blade securing elements **32** and connection portion **58** may be electrically conductive. For example, the blade securing elements **32** with a connection portion **58** (FIGS. **4**A and **4**B) may electrically couple conductive pins **40**, shown in FIGS. **2**A, **3**A, and **3**B. As discussed above, the blades **30** themselves may also be conductive and may electrically couple the conductive pins **40**, with or without the blade securing elements **32**. The blade securing elements **32** without a connection portion **58** (FIGS. **4**C and **4**D) may electrically couple the conductive pins **40**, as shown in FIGS. **2**B and **3**C, for example. The blade securing elements **32** and connection portion **58** may be separate elements or may be integrally formed of the same conductive material.

The blades **30** may be assembled within the cartridge **14** via any suitable mechanism. For example, the blades **30** may be received and secured within grooves or recesses disposed within a body of cartridge **14**. The blade securing elements **32** may then be positioned on or over the blades **30** and either within an additional recess **62** in the cartridge **14** or around the body of the cartridge **14**. The blade securing elements **32** may be electronically isolated from the remaining portions of the cartridge **14**. For use with conductive pins **40** positioned on opposing sides of a slot **36**, for example as shown in FIGS. **1**, **2**A, **3**A, and **3**B, the blade securing elements **32** may be electrically coupled together via connection portion **58**, or one or more other conductive elements (not shown) configured to electrically couple together the blade securing elements **32**, such that the conductive pins **40** may be electrically connected when the cartridge **14** is positioned within the slot **36**. For use with conductive pins **40** positioned on the same side of a slot, for example, as shown in FIGS. **2**B and **3**C, the blade securing elements **32**, or any other suitable conductive elements, without the connection portion **58**, may extend perpendicularly to the blades **30** such that the conductive pins **40** may be electrically connected when the cartridge **14** is positioned within a slot **36**.

According to further aspects, as shown in FIGS. **5**A-**5**D, a system **10"** may include elements similar to a portion of the system **10** discussed above, but where the presence of a cartridge **14"** in a slot **36"** of the dispenser **16"** opens a circuit **42"**, and the absence of a cartridge **14"** in the slot **36"** completes the circuit **42"**. With specific reference to FIG. **5**A, the conductive pins **40"** may be electrically connected by a biased spring switch **64** when slot **36"** is empty, so circuit **42"** may be complete (FIG. **5**C). The conductive pins **40"** and spring switch **64** may extend from the docking station **18"** and may be configured to be positioned within one or more slots **36"** of the dispenser **16"** through the openings **38"**. The spring switch **64** may be fixedly coupled to one conductive pin **40"** and releasably coupled to another conductive pin **40"**, completing the circuit **42"** with the battery **44"** and microcontroller **46"**, as shown in FIG. **5**B. However, insertion of a cartridge **14"** into the slot **36"** may disconnect the spring switch **64** from one conductive pin **40"** and open the circuit **42"**, as shown in FIGS. **5**C and **5**D. For example, the cartridge **14"** may be configured to physically move the spring switch **64** away from and out of contact with at least one conductive pin **40"**. Hence, the insertion of a cartridge **14"** into a slot **36"** may be configured to break the circuit **42"** by disconnecting the spring switch **64** from at least one conductive pin **40"**. Accordingly, the cartridges **14"**, including the blade securing elements (not shown in FIGS. **5**A-**5**D, but similar to the blade securing elements **32**),

may be configured to prevent or restrict the flow of electrical energy, for example, the blade securing elements may be insulated. The spring switch **64** may be biased to return to connect a pair of conductive pins **40"** upon removal of the cartridge **14"** from the slot **36"**, again completing the circuit **42"**.

According to some aspects and similar to FIG. **2**B discussed above, there may only be one pair of conductive pins **40"** to form the circuit **42"** and detect the absence or presence of a cartridge **14"** in the slot **36"**. According to further aspects, there may be two pairs of conductive pins **40"** forming a circuit for the slot **36"**, or each pair of conductive pins **40"** may form a separate circuit **42"**, such that each pair of conductive pins **40"** may detect the absence or presence of a cartridge **14"** in the slot **36"**. Moreover, the conductive pins **40"** may be positioned in any of the arrangements discussed above and in any number of the slots **36"**, and may include a bias connection by spring switch **64**. Each slot **36"** containing conductive pins **40"** and a spring switch **64** that may be coupled to the microcontroller **46"** with a voltage source and a ground such that when the spring switch **64** is closed, the voltage at the microcontroller **46"** is reduced; and when the spring switch **64** is opened, the voltage at the microcontroller is increased.

In another aspect of the disclosure, a push button may be used instead of, or in addition to, conductive pins. For example, as is shown in FIGS. **8**A and **8**B, a push button **70** may be used to open or close a gap in circuit **72** (a portion of which is depicted in FIGS. **8**A and **8**B). FIG. **8**A depicts a push button **72** biased to maintain circuit **72** in an open configuration, and FIG. **8**B depicts a push button **72** biased to maintain circuit **72** in a closed configuration. Circuits **72** depicted in FIGS. **8**A and **8**B may be part of a larger system, like system **10** or system **10"**, described above. As such, circuits **72** may be associated with a slot into which a cartridge may be received, a dispenser, a docking station, or a combination thereof.

In one embodiment, push button **70** may be biased (via, e.g., a spring element) into an open configuration (i.e., normally open, as shown in FIG. **8**A). The presence of a cartridge in the slot associated with circuit **72** of FIG. **8**A may cause force to be applied by the cartridge in the direction of arrow **76** to depress push button **70** into a closed configuration. In the closed configuration, push button **70** may span the gap between two circuit end points **74**. Push button **70** may include conductive material to electrically connect end points **74** when depressed, allowing current to flow. When the cartridge is removed from the slot, push button **70** may be released, and circuit **72** may open, disrupting the flow of current. Thus, if no cartridge is located in the slot associated with circuit **72**, circuit **72** may be open, and if a cartridge is located in the slot associated with circuit **72**, circuit **72** may be closed. In some aspects, end points **74** may each include a conductive pin.

In another embodiment, push button **70** may be biased (via, e.g., a spring element) into a closed configuration (i.e., normally closed, as shown in FIG. **8**B). The presence of a cartridge in the slot associated with circuit **72** of FIG. **8**B may cause force to be applied by the cartridge in the direction of arrow **76** (FIG. **8**A) to depress push button **70** into an open configuration. In the closed configuration, push button **70** may span the gap between two circuit end points **74**. Push button **70** may include conductive material to electrically connect end points **74** when no cartridge is present, allowing current to flow. When the cartridge is present within the slot, button **70** may be depressed, and circuit **72** may open, disrupting the flow of current. Thus, if no cartridge is located in the slot associated with circuit **72**, circuit **72** may be closed, and if a cartridge is located in the slot associated with circuit **72**, circuit **72** may be open. In some aspects, end points **74** may each include a conductive pin. Some push-button embodiments may act as a stand-alone detection system, and apart from the terminals (e.g., circuit end points **74**) of a push-button switch associated with an electronic circuit board, no additional conductive elements may be required.

In some embodiments, one or more proximity sensors may be incorporated into systems of the disclosure in addition to, or instead of, the circuits described above. One or more proximity sensors may be configured to detect whether a cartridge is present in a slot of the present disclosure. FIGS. **9**A and **9**B depict exemplary embodiments of a system **10'"** including one or more proximity sensors **78**. As is shown in FIG. **9**A, proximity sensors **78** may be included in a portion of a slot **36'"** of dispenser **16'"** and/or on a portion of docking station **18'"**. Although two proximity sensors **78** are shown in slot **36'"** of FIG. **9**A, one proximity sensor or more than two proximity sensors may be included. Additionally, proximity sensors may be incorporated in one slot **36'"** or more than one slot **36'"** or may be located in any suitable position relative to slot **36'"** or opening **38'"** of slot **36'"**.

As shown in FIG. **9**B, a cartridge **14'"** may be contained within slot **36'"**. When cartridge **14'"** is located within slot **36'"**, it may be within the nominal range of proximity sensors **78**, which may detect the presence of cartridge **14'"**. Proximity sensors **78** may not need to physically contact cartridge **14'"** in order to detect the presence of cartridge **14'"**. In this way, system **10'"** may be configured to monitor whether or not cartridge **14'"** is within slot **36'"** via use of proximity sensors **78**. In some aspects, system **10'"** may be configured to generate a signal when removal of cartridge **14'"** is detected.

One or more proximity sensors **78** may include a capacitive, radio frequency (RF), photoelectric, optical, electromagnetic, a suitable inductive proximity sensor, and/or any other proximity sensor or sensing technology. In some aspects, a capacitive or photoelectric proximity sensor may detect the presence of a plastic portion of a cartridge within a slot in which the one or more sensors are associated. In some embodiments, an inductive proximity sensor may detect a metal portion (e.g., a blade or screw) on a cartridge within a slot in which the one or more proximity sensors are associated with. In other embodiments, an RF sensor may detect the presence of an RF signal emitted from an RF chip in the blade. Moreover, the proximity sensor may include a magnetoresistive sensor configured to detect the presence (or absence) of a magnetic field.

According to other aspects, as shown in FIG. **6**, a portion of a system **110**, similar to system **10**, may include a protective film **170**. The protective film **170** may be positioned over an unused cartridge **114**, and may extend beyond the cartridge **114** in at least one direction. A user may remove the protective film **170** from the cartridge **114** before shaving. Although only three cartridges **114** are shown in the dispenser **116** of FIG. **6**, it may be contemplated that the dispenser **116** may include any number of slots **136**, and any number of cartridges **114** may be positioned in the slots **136**. The protective film **170** may be positioned over each cartridge **114** in the dispenser **116**, or may be positioned over any one or a subset of cartridges **114**. For example, the protective film **170** may be positioned on the first cartridge **114**A and the last cartridge **114**C, or may be positioned on the second cartridge **114**B and the last cartridge **114**C.

Alternatively, the protective film **170** may be positioned on only the first cartridge **114**A, or may be positioned on only the last cartridge **114**C.

As discussed above, the dispenser **116** and the docking station **118** may be separate elements, or may be integrated together as a single component shown collectively as the docking station **118**. The docking station **118** may include a circuit **172** with conductive pins **140** (not shown) or electrical connections **174** positioned in each slot **136** where a cartridge **114** with a protective film **170** may be positioned. The slots **136** may vary, for example, there may be one slot **136**, more than one slot **136**, or there may be any subset of slots **136**. The electrical connections **174** may partially extend into the slot **136** (e.g., towards a center of slot **136**) from the sides of slots **136**, such that the electrical connections **174** may make contact with the protective film **170**.

According to some aspects, the protective film **170** may be conductive with a resistance. For example, the protective film **170** may include a conductive element or embedded electrical trace, such as, for example, a thin wire **170***a*, extending across a length or width of the protective film **170**. According to other aspects, an entirety or at least a substantial portion of an entirety of the protective film **170** may be conductive itself. The thin wire **170***a* may be disposed on or embedded with the protective film **170***a*. Though only one wire **170***a* is depicted in FIG. **6**, more than one wire **170***a* may be embedded and may traverse the protective film **170***a*. When one or more thin wires **170***a* is provided, a remainder of the protective film **170** may be made of an insulating material, such as, e.g., a polymer. When the protective film **170** is positioned in a slot **136** on a cartridge **114**, the protective film **170** may contact the electrical connections **174**. The protective film **170** may conduct current and have a measurable resistance R. The cartridge **114**, including the blades **130** and the blade securing elements **132**, may be configured to avoid contact with the electrical connections **174** when positioned in the slot **136** without the protective film **170**.

For instance, when three cartridges **114**A, **114**B, and **114**C, each with a protective film **170**, are positioned in the slots **136** of the docking station **118**, the docking station **118** may transmit a current through the circuit **172** connected to each electrical connection **174**. The resulting voltage drop may be indicative of a resistance of 3 R because there are three protective films **170**, each having a resistance R, that may be transmitting current. If a user removes a cartridge **114** for use, the user would then remove the protective film **170** from the cartridge **114**. As such, if cartridge **114** is placed back into the same slot **136**, the resulting voltage drop in the circuit **172** of the docking station **118** would indicate a resistance of 2 R. According to further aspects, to prevent the user from reapplying the protective film **170** to the used cartridge **114**, the protective film **170** may be provided with a single-use adhesive. However, according other aspects, the protective film **170** may be fabricated from a material that loses its applied configuration once removed from the cartridge **114**, thereby making it difficult to re-apply the protective film **170**. As a result, the docking station **118** may be configured to determine when a new cartridge **114** may be first used, and determine how many unused cartridges **114** that may remain in the dispenser **116**.

Based on user data or a programmed algorithm, the docking station **118** may store usage information, provide the same information to a user via a display **54** on the docking station **118** (as in FIGS. **1** and **2**), or may transmit the information via a communication unit **148** to a user device to be displayed to the user or stored in a mobile application. The docking station **118** may automate replacement ordering by contacting a merchant via the communication unit **148**, or may provide a prompt to the user via the display **54** on the docking station **118** or via the user device to confirm a replacement order within a certain period of time. For example, if the second to last cartridge is used, the docking station **118** may place or prompt an order using regular shipping. If the last cartridge is used without a previous replacement order being placed, the docking station **118** may place or prompt an order using expedited shipping. The placement or prompting of an expedited ship order may be based on the accumulated user information, such as, for example, average time between new cartridges, and/or based on input user information, such as, for example, gender, age, preferred trimming or shaving style, etc. The docking station **118** may display or otherwise convey the accumulated user information via the display **54** or user device **20**. For example, the docking station **118** may display the number of shaves each cartridge **114** may perform (which may be automatically detected or may be based on user input), how many shaves a cartridge **114** may be designed to perform, how long the user may have used each cartridge **114**, the cost per shave based on the cost of the cartridges **114** and the number of times each cartridge **114** may be used, and/or length of time each dispenser **116** containing a certain amount of cartridges **114** may last.

Furthermore, the docking station **118** may receive information from the merchant. For example, the merchant may transmit information to the docking station **118** to be displayed or otherwise conveyed to the user such as, for example, sales, coupons, proximity based information, merchant inventory (both understocked or overstocked), different types of cartridges, shaving accessories and/or products, a loyalty point system (for example, every fifth dispenser may be free), referral bonuses, and other promotions.

According to further aspects, the protective film **170** may be insulating, and the cartridge **114**, including the blades **130** and the blade securing elements **132**, may be conductive and include a resistance. The cartridges **114** may be distributed in the docking station **118** with the protective film **170** on the cartridges **114**, and the circuit **172** and the electrical connections **174** may not conduct current, which may be measured by any method as discussed above. If a user removes a cartridge **114** for use and removes the protective film **170** from the cartridge **114**, and then places the cartridge **114** (together or separate from a handle) into the slot **136**, the electrical connections **174** may be electrically connected through the blades **130**, or the blade securing elements **132**, and may conduct a current. The blades **130** and/or blade securing elements **132** may have a resistance, and the docking station **118** may be capable of measuring the resistance. The docking station **118** may also detect when a user removes the cartridge **114** from the slot **136** for the next usage. As such, the docking station **118** may collect information on how frequently a user may shave, the number of shaves for which the user may use a particular cartridge **114**, and/or duration of each shave, etc. The docking station **118** may be connected to a user device and/or to the internet **124** or other connection through the communication unit **148**, and may initiate or offer an option to order additional cartridges **114** and/or dispensers **116** of the cartridges **114** based on the number of new or otherwise unused cartridges **114** in the dispenser **116**. For example, as illustrated in FIG. **6**, the system **110** may transmit a signal from the communication unit **148** to a user device **20** (shown in FIG. **1**) or to a merchant unit **22** (shown in FIG. **1**) that it may be time

to buy new cartridges **114** when the user first removes the second to last cartridge **114**B from docking station **118**.

According to other aspects, system **110** may include both conductive pins **40** extending from the docking station **118** through an appropriate number of openings in a dispenser **116** (if separate from the docking station **118**) as discussed above in regard to FIGS. **1-6** and the electrical connections **174**. As such, the system **110** may determine the presence and absence of both unused cartridges **114** (covered by a protective film **170**) and the presence and absence of used cartridges **114** (uncovered by a protective film **170**). Based on the information received, the system **110** may determine the remaining supply of cartridges **114**, as well as obtain usage data for the shaving habits of the user and the cartridge **114** usage.

According to some aspects, FIGS. **7**A-**7**C depict flow diagrams of exemplary methods for receiving information related to usage of razor cartridges and order placement. For example, as detailed in FIG. **7**A, a method **700** may include a step **702**, in which the removal of a cartridge **14** from a slot **36** may be detected by system **10**. The removal of the cartridge **14** from the slot **36** in the dispenser **16** may open or complete a circuit **42**. A microcontroller **46** may sense a change in the circuit **42**. In step **704**, an order for replacement cartridge(s) **14** and/or dispenser(s) **16** of the cartridges **14** may be initiated. The microcontroller **46** may transmit a command to initiate an order for replacement cartridge(s) **14** and/or dispenser(s) **16**. The command may be transmitted from the docking station **18** to the merchant unit **22** via the internet **24**, as shown in FIG. **1**.

According to further aspects, FIG. **7**B shows another exemplary method **710**. For example, step **712** may include detecting the removal of a cartridge **14** from a slot **36** in a dispenser **16**, which may open or complete a circuit **42**. A microcontroller **46** may sense the change in the circuit **42**. In step **714**, a user may be prompted to confirm that a replacement cartridge **14** and/or dispenser **16** order may be initiated. The microcontroller **46** may transmit a prompt to a user to confirm the replacement cartridge **14** and/or dispenser **16** order. This may include a prompt provided on the display **54** of the docking station **18** or on the user device **20** for a user to selectively confirm the replacement order. The prompt may be in the form of a push notification, a text message, an email, an automated telephone call, or any other similar type of prompt. The user may then confirm or decline the replacement order by touching a button on the docking station **18** or on the user device **20**, responding to the text message, pressing a specific number or number combination on a telephone, or any other similar type of response to a prompt. The prompt may be displayed on and responded to via a mobile application on the user device **20**. In step **716**, an order for replacement cartridge(s) **14** and/or dispenser(s) **16** may be initiated once system **10** receives the confirmation from the user. The microcontroller **46** may transmit a command to initiate the order for replacement cartridge(s) **14** and/or dispenser(s) **16**, and the transmission may be from the docking station **18** to the merchant unit **22** through a connection to the internet **24**. According to some aspects, the user may have a certain time period, for example two days, to confirm or decline the replacement order. According to further aspects, if the user does not decline the replacement order in the certain time period, the replacement order may be automatically initiated without further user intervention or input.

According to further aspects, as shown in FIG. **7**C, another exemplary method **720** is detailed wherein, a step **722** may include detecting the removal of a second to last cartridge **14** from a slot **36** in a dispenser **16**. This removal may be detected by a microcontroller **46** in a docking station **18**. Step **724** may include prompting a user to confirm a replacement cartridge **14** and/or dispenser **16** order, as discussed above regarding FIG. **7**B. This prompt to the user may also include an option to have the replacement cartridge (s) **14** and/or dispenser(s) **16** delivered to the user via standard shipping. The standard shipping prompt to the user also may be an option to place the replacement cartridge **14** and/or dispenser **16** order, but without an automated purchase if the user does not intervene. Step **726** may include initiating an order for replacement cartridge(s) **14** and/or dispenser(s) **16** based on the prompt and a response from the user in Step **724**. Step **728** may include detecting the removal of the last cartridge **14** from dispenser **16**. The microcontroller **46** may detect the opening or closing of the circuit **42**, and may send a signal to the user via any of the transmission techniques previously mentioned. In step **730**, an order for replacement cartridge(s) **14** and/or dispenser(s) **16** of cartridges **14** may be initiated without additional user input. The microcontroller **46** may automatically transmit a command to initiate an order for replacement cartridge(s) **14** and/or dispenser(s) **16**. The command may be transmitted from the docking station **18** to merchant unit **22** via the internet **24**, as shown in FIG. **1**. The command may include an order via expedited delivery, or the delivery method may be automatically selected based on the stored user data and/or preferences.

Any of the foregoing methods **700**, **710**, and **720** may be performed for a dispenser **16** including conductive pins **40** in one, two, or each slot **36**. Similarly, the methods **700**, **710**, and **720** may be selectively performed based on when reordering may be desired to occur. For example, the methods **700**, **710**, and **720** may be performed for the first cartridge **14** if reordering is desired to occur while the user has a plurality of cartridges **14** remaining. Alternatively, the methods **700**, **710**, and **720** may be performed when the last or second to last cartridge **14** is removed from the corresponding slot **36**. Moreover, as discussed above, conductive pins **40** and/or electrical connections **174** may be positioned in each slot **36** such that the docking station **18**, microcontroller **46**, and memory **50** may collect user usage data. Likewise, a user may return a cartridge **14** to a slot **36** between uses, electrically connecting the conductive pins **40** again, such that information on the time between uses, duration of use, uses per cartridge, etc. may be collected. This user data may be stored in memory **50**, and the microcontroller **46** may factor in the user data in the user prompting and ordering steps as detailed above.

Furthermore, in any of the aforementioned methods, the user may have the option to order multiple dispensers **16** of cartridges **14**, additional handles **12**, or other products from the merchant unit **22**. The microprocessor **46** and/or the merchant unit **22** may track these optional purchases and incorporate the selections in future prompts and orders. For example, if the user orders two replacement dispensers **16** full of cartridges **14**, the microcontroller **46** may not initiate an order or prompt the user to place an order for replacement cartridges until the user has depleted one replacement dispenser **16** and is using the cartridges **14** of the second replacement dispenser **16**. The microcontroller **46** may track the first replacement dispenser **16** being inserted into and later removed from docking station **18** where, for example, docking station **18** may be configured to removably receive the dispenser **16**. According to some aspects, the dispenser **16** or cartridges **14** may include radio-frequency identification tags or other identifying markers that may allow the

microcontroller **46** of docking station **18** to recognize each dispenser **16**. The identifying markers may also be transmitted from the merchant unit **22** to the docking station **18** via the internet **24** so the docking station **18** may recognize the receipt and placement of particular dispensers **16** or cartridges **14** into the docking station **18**.

Additional aspects may be incorporated in any of the elements and systems discussed above. For example, the dispenser **16** and docking station **18** may monitor and store how many times a cartridge **14** has been used. Such information may be user input information or may be automatically collected by sensing the presence or absence of the cartridge **14** in a slot **36** as discussed, or by sensing the presence or absence of the handle **12** on the handle holder **52**. The docking station **18** may store a recommended number of usages for each cartridge **14**. The recommended number of usages may be a standard number, or the recommended number of usages may vary depending on the type of cartridge **14**, user shaving habits, user hair and body type, etc. The user hair and body type may be monitored by elements coupled to the cartridge **14** and/or the razor handle **12**, such as, for example, a camera or other sensing element. If a cartridge **14** has been used more than the recommended number of usages, the docking station **18** may produce an audible or a visible notification to indicate to the user that he or she should replace the cartridge **14**. This notification may also be sent to the user device **20**. This notification may appear on the display **54** of the docking station **18**, may be a flashing light, or any other indication. The docking station **18** may include a manual reset to override the cartridge usage notification. The notification may also be based on the number of user strokes detected by a stroke sensing element coupled to or a part of the cartridge **14** or handle **12**, in addition to number of usages. For example, if a user is only trimming the edges of a beard, the user may use fewer strokes, and thus the cartridge **14** may have a higher recommended number of usages than if the user was shaving a face or legs and using a greater number of strokes.

The docking station **18** also may serve as a charging station for an electric razor. For example, the docking station **18** may include a razor connection. The razor connection may be wired or wireless, to allow for wired or wireless charging of the electric razor. The docking station **18** may also include a razor mount, and the razor connection may be a wireless antenna charging connection such that the docking station **18** may charge the razor when the razor is placed on the razor mount. If the razor connection is wired, docking station **18** may include a cable output of a specific voltage level appropriate for recharging the battery of the electric razor. Alternatively, the docking station **18** may include a cavity (not shown) and/or extension element (not shown) that includes charging pins (not shown) on which the electric razor may be mounted in order to recharge the battery of the electric razor. The cartridge sensing capabilities discussed above may also be used for electric razor blades.

The systems **10**, **100**, and methods **700**, **712**, and **720** may allow a user to more efficiently and effectively track razor cartridge usage and place replacement razor cartridge orders. In particular, a user may more easily order cartridges **14** and other products when the user may be in need of replacements. Moreover, a user may more easily track the lifetime of a particular cartridge **14**. The system may assist in ensuring that the user does not use a cartridge **14** beyond the recommended usage, and may also assist in ensuring that the user does not discard a cartridge **14** before the recommended cartridge lifetime. The disclosed systems and methods also may provide a merchant the ability to track cartridge usage and purchasing patterns of a user. As such, the merchant may provide targeted advertisements or offers to the user, or to other potential consumers in locations close to the user. Additionally, it is understood that the systems and methods disclosed herein may be applied to various other applications as well, including replacement heads for an electronic toothbrush and any other replaceable element.

While principles of the present disclosure are described herein with reference to illustrative examples for particular applications, it should be understood that the disclosure is not limited thereto. Those having ordinary skill in the art and access to the teachings provided herein will recognize additional modifications, applications, embodiments, and substitution of equivalents all fall within the scope of the features described herein. Accordingly, the claimed features are not to be considered as limited by the foregoing description.

What is claimed is:

1. A shaving system, comprising:

a dispenser including a plurality of slots, a first slot of the plurality of slots is configured to releasably receive a cartridge having at least one razor blade and a blade securing element; and

an electrical circuit associated with the first slot and including a first electrically conductive element and a second electrically conductive element, the first electrically conductive element and the second electrically conductive element are spaced apart from one another to form a gap therebetween;

wherein:

the electrical circuit is configured to switch between an open configuration in which the gap is unbridged between the first electrically conductive element and the second electrically conductive element and a closed configuration in which at least one of the blade securing element or the at least one razor blade spans the gap, electrically connecting the first electrically conductive element and the second electrically conductive element;

the system is configured to detect removal of a first cartridge from the first slot based on whether the electrical circuit is in the open configuration or the closed configuration; and

the system is configured to generate a signal when removal of the first cartridge is detected.

2. The system of claim **1**, wherein the signal is configured for transmission to a third party.

3. The system of claim **1**, wherein the first slot contains the first cartridge positioned therein, and the first cartridge positioned within the first slot switches the electrical circuit into the closed configuration.

4. The system of claim **1**, further including a docking station configured to receive the dispenser, wherein at least a portion of the electrical circuit is included as part of the docking station, and wherein the system is configured to detect placement of the cartridge back into the dispenser, and the docking station is configured to collect information on shaving frequency or shaving duration.

5. The system of claim **1**, wherein at least a portion of the electrical circuit is included as part of the dispenser.

6. The system of claim **1**, further comprising at least one proximity sensor, wherein the system is configured to detect the removal of the cartridge from the slot using the at least one proximity sensor.

7. The system of claim 1, further comprising a push button, wherein the system is configured to detect the removal of the cartridge based on whether or not the push button is depressed.

8. The system of claim 1, wherein the signal is a request for delivery of at least one new cartridge.

9. The system of claim 1, wherein the system includes the cartridge having the at least one razor blade, and the at least one razor blade is configured to span the gap to electrically connect the first electrically conductive element and the second electrically conductive element.

10. The system of claim 1, further comprising at least one controller, a communication unit, a memory, and a display, wherein:

the system includes the cartridge, and the cartridge is a razor cartridge configured to be releasably attached to a razor handle;

at least one of the razor cartridge or the slot includes a snap-fit configuration so that the razor cartridge is snap-fitted into the slot,

the razor blade is configured to span the gap to electrically connect the first electrically conductive element and the second electrically conductive element;

the first and second electrically conductive elements are first and second pins at least partially provided in the slot;

the razor blade contacts the first and second pins in the closed position;

the at least one controller is configured to detect removal of a first razor cartridge from a first slot when the electrical circuit is in the open configuration;

the at least one controller is configured to detect placement of the first razor cartridge back into the first slot when the electrical circuit is in the closed configuration;

the at least one controller includes a microcontroller configured to generate a current and measure at least one of the current or a voltage difference;

the memory is configured to store a number of times the electrical circuit is in the opened configuration and a number of times the electrical circuit is in the closed configuration;

the at least one controller is configured to determine shaving information, the shaving information including at least one of:

how frequently a user shaves,

a number of shaves for which the user may use a particular razor cartridge among the at least one razor cartridge,

a duration of each shave, or

a number of used or unused razor cartridges based on a presence or absence of a protective film on each razor cartridge among the at least one razor cartridge;

the display is configured to provide at least one of shaving advice or usage advice to the user; and

the communication unit is configured to transmit, based on the determined shaving information, at least one of:

a notification to the display,

a notification to a remote device of the user, or

a purchase order to a merchant device to purchase a new dispenser or a new razor cartridge.

11. A shaving system, comprising:

a dispenser including a plurality of slots configured to releasably receive a plurality of cartridges, respectively, each slot being configured to releasably receive a given cartridge of the plurality of cartridges, each cartridge including at least one blade and a protective film, and

at least one controller, the at least one controller being configured to:

detect a removal of one of the plurality of cartridges from a corresponding slot of the plurality of slots,

in response to detecting the removal, generate a signal for transmission to a third party,

detect placement of a removed cartridge back into the corresponding slot,

collect shaving information based on the detected removal and detected placement of the removed cartridge,

determine a presence or absence of the protective film, and

determine a number of unused cartridges based on the determined presence or absence of the protective film.

12. The system of claim 11, wherein:

each slot includes at least one conductive element and each cartridge includes a corresponding conductive element, the at least one conductive element being configured to engage the corresponding conductive, and

the at least one controller is configured to detect the removal and the placement of the removed cartridge from the corresponding slot by detecting when the at least one conductive element disengages from the corresponding conductive element on the removed cartridge.

13. The system of claim 12, further comprising at least one electrical circuit configured to switch between an open configuration and a closed configuration, wherein:

the corresponding conductive element includes at least one of the blade or a conductive blade securing element configured to secure the at least one blade to one of the plurality of cartridges, and

engagement of the at least one conductive element and the corresponding conductive element closes the electrical circuit, and disengagement of the at least one conductive element and the corresponding conductive element opens the electrical circuit.

14. The system of claim 11, further comprising a docking station configured to receive the dispenser, the docking station including a display configured to provide shaving or usage advice to a user, wherein the shaving information includes shaving frequency or shaving duration.

15. A shaving system, comprising:

a razor cartridge having at least one conductive razor blade, the razor cartridge being configured to be releasably attached to a razor handle;

a dispenser including a plurality of slots, each slot configured to releasably receive the razor cartridge; and

a controller, wherein:

a conductive element is at least partially provided in each slot,

the razor cartridge includes a corresponding conductive element, the corresponding conductive element including the conductive razor blade,

the conductive element is configured to contact the corresponding conductive element to close an electric circuit, and

the controller is configured to determine a removal of the razor cartridge from the dispenser when the electric circuit is opened.

16. The shaving system of claim 15, further comprising a docking station configured to receive the dispenser and including the conductive element.

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UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 11,439,216 B2
APPLICATION NO. : 16/622430
DATED : September 13, 2022
INVENTOR(S) : Alexandra Antonakou et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Claims

In Claim 12, Column 20, Line 25, delete “conductive,” and insert --conductive element,--.

Signed and Sealed this
Sixth Day of December, 2022

Katherine Kelly Vidal

Katherine Kelly Vidal
Director of the United States Patent and Trademark Office